

Birmingham Section.

Meeting held at Birmingham University, on
Thursday, February 4th, 1915.

MR. HARRY SILVESTER IN THE CHAIR.

FACED PEARL BARLEY.

BY J. F. LIVERSEGE, F.I.C., AND HERBERT HAWLEY,
M.S.C., F.I.C.

Published references to pearl barley appear to be scanty. In Church's "Foods" it is stated that 100 lb. of barley yields about 37 lb. of pearl barley, the percentage composition of which is given as:—water 14.6, albuminoids and nitrogenous compounds 6.7, oil 1.3, starch, etc., 75.5, cellulose 0.8, and mineral matter 1.1%. In 1905 Matthes and Muller reported on twenty-five samples of pearl barley. Sixteen were free from talc, five contained less than 0.2%, and the remainder up to 0.63% (Analyst, 1905, 206). Dr. Hamill's report to the Local Government Board in 1909 on faced rice, stated that the practices of polishing and like treatment "appear now to be extending to other cereals, such as pearl barley, hitherto sold in their natural condition without mineral admixture."

Recently there appears to have been an increase in this form of adulteration, some samples we have examined showing as much as 0.82% of mineral facing. The total ash was usually determined on 10 grms., and the ash insoluble in acid by treating this ash with hydrochloric acid of about normal strength. The following table gives particulars of 73 samples which have been examined in the City Analyst's laboratory since 1910. A number of samples which are known to be duplicates have been excluded.

No. of samples.	Insoluble ash.	Total ash.
	%	%
50	0—0.04	0.64—1.18
10	0.05—0.09	0.82—1.10
7	0.10—0.19	0.79—1.17
1	0.22	1.32
1	0.38	1.51
2	0.40	1.32—1.48
1	0.76	1.62
1	0.82	1.61

It will be seen that a large proportion of the samples (50 out of 73) contained less than 0.05% of insoluble ash, and of these only one contained more than 1.10% of total ash. We consider that 0.1% of insoluble ash is a very reasonable allowance, and that samples containing a larger proportion than this should be considered adulterated with mineral facing. The total ash should not exceed about 1.1%.

Last year, as a result of convictions elsewhere, we examined a number of samples which had been faced with rice in quantities varying from 0.5 to 2.0%. Two other samples had been faced with both rice and mineral facing, the total amount of the adulteration being 0.5 and 1.0% respectively. The samples faced with talc usually yielded no dust when shaken on a No. 20 sieve. Those faced with rice vary considerably in this respect. One sample of rice-faced pearl barley yielded 2% of dust which was largely rice, and on rapidly washing 10 grms. of the sieved barley in a small glass

dish, with five separate quantities of 10 c.c. of water, and evaporating the washings to dryness, 0.5% of residue was obtained. Another sample yielded 0.2% of dust, chiefly rice, and 3.6% of dry solids was removed by washing. Part of the washings was cleared by means of a centrifuge, and the soluble part was found to be 0.7%—showing that the sample contained 2.9% of facing not removed by the sieve.

Microscopical examination of the washings showed that about 75% of the facing was rice. In these two cases prosecutions were instituted, but as the retailers were ignorant of this novel form of adulteration the magistrates only ordered the vendors to pay costs.

Twenty-three samples not faced with rice or mineral matter were shaken on the sieve. Thirteen of them yielded less than 0.2% of dust, nine samples yielded from 0.21 to 0.50%, and the remaining sample 1.27%.

We understand that millers assert that facing is necessary to protect pearl barley from weevils and mites. As far as rice is concerned this seems a strange statement, as millers have maintained that rice itself requires facing with talc. On careful examination, some samples of pearl barley were found to contain a hole, and were either grey, brown, or black. These grains had been attacked by weevils. Eleven out of 21 samples, or 52%, of unfaced pearl barley had been attacked in this way; in the worst sample about one grain in three thousand had been attacked by the insects; seven out of twelve, or 58%, faced samples had been similarly affected; in the worst of these one grain out of 270 was attacked. Two of these had been faced with talc, three with rice, and two with both rice and talc. These numbers are not large, but they give no evidence of the protecting power of the facing.

We have not succeeded in detecting mites in samples that are free from dust. If the dust from samples containing mites is put into water, small brown particles can be seen by the naked eye, and the majority of these on microscopical examination are found to be mites. Of the four samples of pearl barley containing mites, two were faced with rice, and two were not faced. The amount of dust varied from 0.17 to 2.0%.

It seems probable that the real object in facing pearl barley is to improve the appearance. To produce a satisfactory, uniformly white pearl barley entails a fair amount of waste. If the grains are not uniform in size, or the milling is not carried sufficiently far to remove the brown coat of the grain, the pearl barley is not uniform in appearance, and we have proved that rice flour stuck on to such pearl barley by means of glucose effects a decided improvement. Facing may therefore be considered in the words of the Sale of Food and Drugs Acts, "intended to conceal the inferior quality thereof."

DISCUSSION.

The CHAIRMAN asked by what method the authors determined the talc. Mr. E. W. T. Jones had devised a simple and expeditious one for the estimation of talc on faced rice in which the rice was heated with ether, which was decanted, and then with water which was also decanted, thus removing the whole of the talc. Evaporation of the liquids and weighing of the ignited residue gave the quantity of talc used for facing the rice.

Mr. A. E. JOHNSON said that he had found Mr. Jones' process simple and efficient.

Mr. E. W. MANN said that the suggested limit of 0.1% insoluble ash seemed quite reasonable.

The faced samples were quoted at the highest price in the market. There was no organisation in the food trade for stopping these products from getting to the retailer. The grocer might receive his first intimation of the occurrence of such an adulteration in the form of a police-court summons.

Mr. F. H. ALCOCK said that if a thing were artificially faced it must not necessarily be assumed to be adulterated. For example, rhubarb was faced with powdered rhubarb to improve its appearance. He did not think that would be adulteration.

Mr. J. C. MANN asked what became of the 70% which was stated to be lost in the process of facing? What would be the food value of the barley without facing?

Mr. LIVERSEGE, in reply, said that Mr. Mann's statement as to the prices of faced barleys proved that the facing was done to cover an inferior barley and give it an inflated price. He thought glucose or oil would be needed to make the facing adhere. As to whether facing a food or drug with its own powder constituted adulteration, he mentioned that in America if pearl barley had been faced with barley it would have to be described as "coated with glucose and starch." The Americans did not consider it legitimate to cover pearl barley even with barley.

The question of whether the ash insoluble in acid represented the mineral facing had been discussed several times. Krizian had described an elaborate process for examining faced rice, which gave exactly the same results as their own method. Church's figures showed that the wastage from the pearl barley was about two-thirds. He did not think that the food value of barley was very different from that of pearl barley. The improvement was in appearance only.

Newcastle Section.

Meeting held at Bolbec Hall on Wednesday, 16th December, 1914.

PROF. H. LOUIS IN THE CHAIR.

SOME METAL FAILURES IN PLANT.

BY S. EVANS, M.Sc., A.M.S.T., A.M.I.M.M.

This paper contains an account of a few problems a little wide of the usual routine, which have come under the author's personal observation. As far as possible, an attempt has been made to classify the various examples. In almost every engineering works, the "metallurgical" failures must naturally take first place in number and importance, and cases under this heading are dealt with first. Secondly, one or two cases of corrosion are noticed, and finally, a collection of smaller matters, which, though as a rule quite simple in themselves, yet are of more or less importance in the economies of a large works, as their comparative insignificance renders them liable to be overlooked.

Case 1. Several "Durana" metal bolts, about 1 inch diameter, were returned fractured from the continent, where they were used for bolting together the portions of a small magnetic circuit.

The composition of the metal was Cu 59.55%, Zn 39.00%, Fe 0.91%, P 0.84%.

The sketches (see Fig. 1) show the positions of the microscopic sections cut.

In section No. 1, three small cracks were visible, though the structure was quite normal and uniform. In section No. 2, no flaws of any description were visible, but flow lines due to forging were visible under the microscope.

Mechanical tests showed good tensile strength and elongation. The bolts therefore showed no weakness in structure or properties and had evidently been tightened up beyond their elastic limit. It was afterwards ascertained that they did actually break in the process of erection.

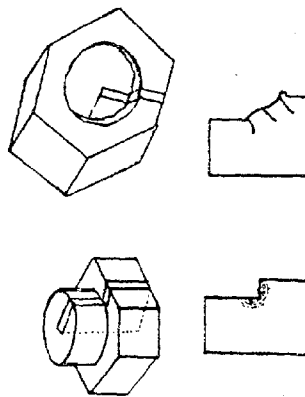


FIG. 1.

Case 2. This was a nickel steel sparking plug for a vertical gas engine. Sheet mica washers are threaded on the plug, bolted up tight, and the mica turned off to a cylindrical form. The plugs are bolted in to the cylinder head. This particular plug failed near to the plug head. Sections were cut adjacent to the fracture and the other extremity.

The cold end of the plug showed the typical close grained structure of nickel steel; at the hot end which failed, the heat had caused the segregation of the cementite. The plug would naturally be under tension all the time and it is evident that the segregation was the cause of fracture.

Case 3. Of two 2½ inch connecting-rod bolts from a 750 H.P. vertical gas engine, one snapped off short, whilst the other bent double. Test pieces from both bolts were good in every respect. In the longitudinal section from the fractured bolt (taken near the fracture) high carbon streaks were visible to the naked eye.

The sulphur and phosphorus were quite low. The microscopic examinations for both bolts, and the two inch black bar from which they were forged, are tabulated on page 205.

Case 4. Fractured chain links (two links of ½ inch and ¾ inch wrought iron) showed a coarsely crystalline fracture. The fractures were cut off and preserved, micro-specimens were cut and sections in the two principal planes prepared.

The links were divided, and one half of each was annealed for ½ hour embedded in sand from 700° C. to 800° C. On fracturing the usual tough fibrous structure of wrought iron was evident. Small test pieces were cut from the two halves and a marked difference in ultimate stress, elastic limit, and elongation observed. In the case of the small link the fracture had occurred at the old weld surface, which was oxidised, and had evidently been imperfectly joined. The large amount of slag present in the material undoubtedly helped to weaken the link, but the primary cause of fracture was not actual lack of annealing, of which the chain received plenty, but annealing at too low a temperature. The coarsely crystalline structure is said to be produced in iron containing less than 0.11% carbon by heating to below 700° C.



No. 1.—Connecting-rod Bolt $\times 450$.



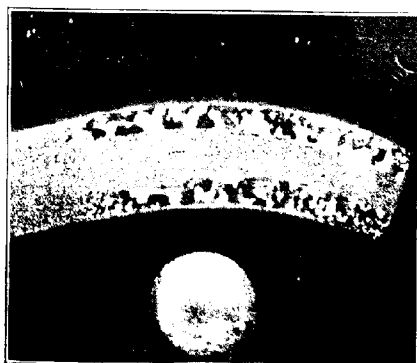
No. 2.—Connecting-rod Bolt $\times 150$.



No. 3.—Brass Gauge Cock $\times 150$.



No. 4.—Steel Crosshead $\times 150$.



No. 5.—Soft Iron Rod.

for some time. The crystal grain in the slaggy layers was much larger than in the slag-free layers; this may be accounted for by the fact that the latter are more continuous and flexible and will respond to any vibratory motion, which will be absorbed in the rigid and discontinuous slaggy layers with the consequent increase in vibration

0.046% S, 0.45% Mn, and 0.075% P. The un-etched microscopical section showed some honey-combing. When etched the phosphorus and sulphur were quite evenly distributed, but the distribution of the carbon showed that the material had not been annealed, and this was the cause of fracture (see photomicrograph No. 4).

Etched with:	Section.	Bolt bent double.	Bolt snapped.	3½ inch black bar.
Picric acid	Longitudinal	Sulphur and carbon badly segregated.	Very badly segregated. High S visible to naked eye. C badly segregated.	Sulphur segregated. Carbon uniform.
	Transverse.	Sulphur and carbon fairly uniform.	Sulphur and carbon badly segregated.	Sulphur segregated. Carbon uniform.
Nitric acid	Longitudinal.	Sulphur and phosphorus badly segregated.	Sulphur and carbon badly segregated.	—
	Transverse.	Sulphur and phosphorus fairly uniform.	Sulphur and carbon badly segregated.	—

Photomicrographs. No. 1. 3½ inch black bar with streak of MnS but uniform carbide areas.
No. 2. Fractured bolt showing segregation of carbide.

in these layers. A similar phenomenon was observed in case 11, and would seem to indicate the greater susceptibility to "fatigue" of slaggy iron and hence the importance of removing all slag.

Case 5. The entrance to a condenser pump delivery was covered with copper sheathing, which was beaten over a former before being placed in position. In spite of frequent annealing by heating to redness and quenching, the material cracked under the hammer. Under the microscope the copper oxide pellets were visible and this led to the belief that the copper was probably a little underpoled. No arsenic eutectic was visible. By annealing in a reducing atmosphere the copper worked satisfactorily under the hammer and this treatment overcame the difficulty.

Case 6. A number of brass gauge cocks for a Babcock and Wilcox boiler leaked slightly and it was found impossible to stop the leakage. The maker's opinion was that the boiler water was attacking the metal and eating its way through. An examination of one or two of the cocks showed that there was practically no corrosion of the metal, but that several small blow-holes were visible on the inside surface. Microscopical examination showed that the metal was badly blown, and it was evident that the castings were faulty. On inquiry it was found that similar consignments from the same makers had given no trouble. The micrograph (No. 3) shows one of these blowholes.

Case 7. In a surface condenser in which one of the phosphor-bronze stays failed, the cause proved to be a crack, which, when opened out, was ½ inch deep and 8 inches long, the sides of which were badly oxidised. The forging had evidently been finished at too low a temperature.

Case 8. The mild steel pull-rod on a brake snapped. The rod was about 2 inches by ½ inch, containing 0.15% C, 0.015 Si, 0.60% Mn, 0.005% S, and 0.063 P. Test pieces cut from both sides of the fracture proved to be quite normal. Microscopical examination of sections cut from either side of the fracture revealed in one case a large segregation of MnS. The fracture occurred a little to one side of the point where the head was welded on to the rod. The weld itself was quite good under the microscope, but evidently the heating had caused the manganese sulphide to segregate, and this segregation had caused incipient cracking, due to vibration, which had gradually extended until the rod failed.

Case 9. A steel crosshead on a gas engine failed. The analysis was 0.37% C, 0.27% Si,

Case 10. A portion of a water turbine bucket from Christiania which had fractured. The analysis was 0.095% C, 0.18% Si, 0.06% S, 0.31% Mn, and 0.014% P. Crystallisation had set in, and the fracture was like grey cast iron. The peculiarity about the fracture was that the grain was by far the largest along the centre plane of the metal and became gradually smaller towards the surfaces. This seemed to indicate that the crystallisation, probably the result of vibration, had commenced where the two sets of waves from the surfaces had interfered (i.e., on the central plane) and had gradually spread from this plane outwards.

CASES OF CORROSION.

Case 11. Complaints were received of excessive corrosion of a mixed pressure turbine, the metal naturally being blamed by the user of the machine and the water being blamed by the constructional engineers. The machine was one of a set of two, installed in a salt works, the engine room being adjacent to a room containing six vacuum evaporating pans and the salt bins. The other conditions were similar to those in various parts of the United Kingdom under which machines were running satisfactorily. On opening the machine out, it was found that the outside wheel on the high pressure side and the outside wheel on the low pressure side were coated with red Fe_2O_3 , whilst all the intermediate wheels were coated, as is usually the case, with a thin adherent skin of black Fe_3O_4 . This showed that the cause of the trouble was common to both extreme ends of the rotor, and since one end used high pressure steam and the other low pressure steam, the only condition common to both ends was when the machine stopped and air was drawn in through the glands. The evaporating pans in the adjacent room were totally enclosed, but the open bins containing the damp salt were in the same building. The conditions now resolve themselves as follows:—

On stopping the machine, all the diaphragms would be dripping water, and as the gland pressures dropped, air would be drawn through them into the machine, and would pass through the first diaphragm blades, where the slight trace of salt, left in after passing the glands, would be extracted. This naturally would give rise to progressive oxidation; the outer cast iron casing of the machine was also rusted for some distance from both ends. The remedy suggested was to keep the glands sealed by low pressure steam during the time the machine was standing.

Case 12. In this turbine "excessive corrosion" was reported to have taken place in two months, and again acidity of the water was cited as the possible cause. The water contained total solids, 210 grains per gallon: NaOH, 14.5; Na_2CO_3 , 31.2; Na_2SO_4 , 79.8; NaCl, 67.2; CaCO_3 , 2.87; organic matter, 15.68 grs. per gall., and was found to be neutral to litmus.

Portions of the machine were returned for examination, and then the cause was evident. The effect was most marked in the first portions of the machine and showed itself as a series of smooth grooves, up to $\frac{1}{4}$ inch deep on the outer casing and the shrouding on the stator blading, also on the edges of all blades, and the inside faces of the rotor diaphragms.

Microscopical examination of the mild steel, nickel steel, and bronze used in the construction showed no abnormal structures. Some weeks afterwards it was discovered that the drainage valve had been left closed from the commencement and none of the water (condensed) in the machine could get away. Thus the start up every day would take place in the presence of an appreciable quantity of water, until the machine became warm enough to evaporate it.

Case 13. The lower portion of the outer cast iron casing of a feed water heater became pitted. The cold water entered at the bottom, and as it ascended became heated by exhaust steam. The pitting was simply due to the electrical action set up between the metals and the gas bubbles liberated from the water by the heat. Above the "gas liberation" line no pitting took place.

MISCELLANEOUS CASES.

Case 14. Iron castings, which were too hard to drill, were generally found to have a high phosphorus content. In many cases the drill would enter but "flake" pieces of iron off, on the under side, as it emerged. The phosphorus was from 1.3% to 1.4%. The author has often used dilute hydrochloric acid as an aid to drilling, in order to save a large casting from being scrapped.

Case 15. The removal of the sand from the interior of intricate castings (in this case a turbine nozzle box) was effected by dilute (1:4) hydrofluoric acid, on the assumption that it dissolved the silica. This cost about 10s. per casting. Chipping with bars cost about £1 per casting. The author substituted dilute commercial hydrochloric acid, which dissolved the iron (and therefore loosened the sand) better, and cost about 1s. 6d. per casting.

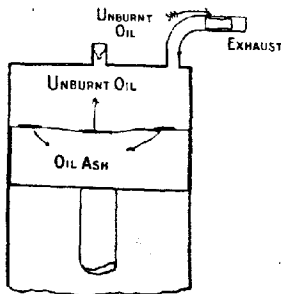


FIG. 2.

Case 16. In this case the effect of the oil ash on a Diesel engine was noticed. On a cast iron cylinder 18 inches diameter, an enlargement of 0.028 inch had taken place in 2 months. The

enlargement was near the cylinder head and was evidently due to the polishing action of the oil ash. The position and character of the deposits on opening out the cylinder are shown in Fig. 2.

The cylinder irons used showed on analysis:—

	G.C.	C.C.	Si.	S.	Mn.	P.
No. 1 ..	1.89	.82	2.13	.04	1.72	1.55
No. 2 ..	2.15	.63	1.54	.07	.34	.42

Assuming $\frac{1}{2}$ lb. oil per B.H.P. then a 450 B.H.P. engine would take 225 lb. oil per hour, or in 2 months made up of 10 hour days it would need about 100,000 lb. of oil, representing 110 lb. ash.

What happens is that a certain amount of ash is carried away in the exhaust and the amount remaining in the cylinder will be practically constant. Of this ash, it is evidently the nature and not the amount which is the important factor.

Case 17. A large number of small meter cases, which were stamped to form, from an American rolled brass, and then dipped in ordinary cold lacquer, were found to corrode rapidly. The lacquer attacked the rolling marks on the brass and turned them black, and any accumulation of lacquer in screw holes, corners, etc., became rapidly coloured with a green copper salt. This entirely spoiled the appearance of the meters. Separation of the copper salt and determination of the melting point of its fatty acid gave 170° C. corresponding to abietic acid. The acidity of the resin was equivalent to 49% of caustic potash on the dry resin. Thirteen samples of resin lacquers (both hot and cold) gave acidities varying from 6% to 81% (KOH) equivalent on the dry resin. Finally a celluloid lacquer was substituted as being the only suitable material.

Case 18. Two explosions occurred in the crank case of a 1000 B.H.P. vertical gas engine of the 8-cylinder, tandem type. The fan attached to the crank case was designed to remove the air three times per minute. The outlet was 6 inches diameter originally, but was at the time only 2 inches and subsequently increased to 3 inches. The explosions blew off the crank case and a dark red flame issued from the casing. A sample of the oil from the crank case was almost black and compared with the original oil as follows:—

	K.V.	F.P.
Original oil	0.45	235° to 240 C*
Old oil	2.70	170° C. (tricky)

The spray of oil in the crank case had ignited by some means and the formation of an explosive mixture was made possible by the reduction in diameter of the fan delivery. It is doubtful whether there may not have been a slight leakage of gas into the crank chamber, but the actual explosion was an oil explosion and it would have been advisable to test the crank case oil for flash-point at intervals.

Case 19 was a cracked gas engine casing. Fig. 3 is an outline of the casing showing the position of the cracks.

The water jacket was practically full of deposit consisting of CaCO_3 , 85.29%; organic matter, 27.31%; moisture, 1.20%. The cooling water used contained 46.4 parts per 100,000 of total solids. Other contingent sources were:—

*Source.	Total solids.	NaCl.	CaCO ₃ .
	parts	per 100,000.	
river	35.8	—	20.9
fill pond	34.5	4.1	19.1
sewerhole	45.3	9.56	25.8
well	126.7	49.7	40.87

Apart from the cracking the loss of cooling efficiency must soon be enormous with these hard waters, and it is much more economical to soften the waters before use.

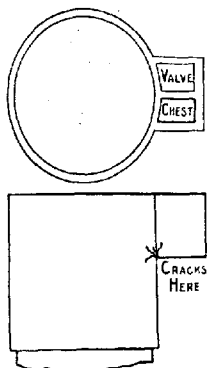


FIG. 3.

The above examples are very simple in their treatment, but perhaps serve to show how the chemist may be of service in an engineering works, where at present, it is to be regretted, he is often looked upon as somewhat of a luxury.

DISCUSSION.

Dr. J. E. STEAD said that the conclusion the author had come to, viz., that soft iron crystals developed into large ones by heating at about 700° C., was one which he (the speaker) had himself advanced years ago, but the researches of Sauveur had shown that they did not grow to a very great size, unless the material were previously strained when cold, or when at a temperature below redness. It had been proved that distortion, if either excessive or slight, did not lead to crystal growth on annealing; that there was a limited range of strain, which led to this development. The influence of strain, within and under the critical range, was illustrated in the photograph, No. 5. It represented a longitudinal section of a soft iron rod, bent when cold and afterwards case hardened at a temperature below Ac3. There was no distortion at the right-hand portion but the bending increased towards the right. Although the central part must have been strained, the crystals there were no larger than they were in the straight undistorted portion at the left, a proof that slight straining did not lead to crystal growth. It also proved that tensional and crushing strains, within the critical range, had the same effect in their tendency to make the iron liable to crystallise into large crystals. The outside envelope was carburised and fine grained. The smaller photograph represented a cross section, and showed that the big crystals did not surround the bar, but were confined to the parts distorted within the critical strain range. The specimen had been discovered by Mr. H. S. Koplring and sent to him (Dr. Stead). The black area with a jagged boundary in the brass gauge-cock did not appear to him to be a blowhole, as blowholes were always more or less spherical. He had noticed similar dark patches in brass and bronze, but these had been found to be slag inclusions or cavities from which slag had

fallen out during polishing. The author suggested that manganese sulphide segregated when the steel was heated, but one peculiarity of this substance was that it was the most fixed of any part of steel, and did not move about, neither did it diffuse. He had noticed in badly made welds, silicate of iron, which might possibly be taken to be manganese sulphide. It was, however, easy to determine which it was by the Baumann acid silver paper test. He quite agreed that for most purposes, soft steel might contain as high as 0.075% phosphorus. It was important when referring to the annealing of steel to state the temperature of heating. In former times it was customary to heat steel to a dull red heat, to take out internal strain. Steel castings, if annealed at 700° to 750° C., had not their coarse crystalline structure removed. It was necessary to heat sufficiently to cause a complete change of the mass from the α to the γ allotropic condition, and that heating was now usually called heat-treatment. Some makers, however, still retained the word "anneal," but qualified it by giving the temperature at which the steel was heated. The Widmannstätten structure of a steel which the author said was evidence that the steel had not been annealed, only showed that it had not been heated to above the critical point Ar3. It might have been heated or annealed at a dull red heat, but not heated sufficiently highly, or, to about 900° C. Graphitisation was a kind of corrosion, but required more study before a definite general conclusion could be arrived at as to its cause. He had met with many cases in gas meters, but sometimes, under like conditions, graphitisation in similar gas meters did not occur. He was doubtful whether acid as a lubricant for drilling phosphorettic metal, attacked the phosphide of iron, as that substance was left insoluble on treating such iron by dilute acid. With regard to the growth of the upper part of a steam cylinder referred to, he asked whether the cylinder had been measured externally as well as internally, for it was known that metal "grew" or expanded permanently when subjected to the influence of superheated steam.

The AUTHOR said, in reply, that in many cases conclusions were necessarily drawn from somewhat scanty information. The nature of the circumstances made this almost compulsory. The information in most cases was supplied by the engineer, the author's opinion was given, and if the treatment suggested overcame the difficulty, he confessed that the particular case was soon dismissed from mind. He had never produced the coarsely crystalline structure in low carbon iron, by heating below 700° C., as his duty was to remove it. He regretted that the brass gauge-cock mentioned was not available; but the depth of the hole and its irregular shape, taken in conjunction with the "porosity," rather inclined him to the belief that it was primarily a cavity. As regards the shape, he suggested that during the formation of the cavity, the metal might still have been in movement, and that the irregularity might have been due to this. He had not intended to discriminate between blowholes and cavities in that connection. He had not applied the silver-paper test for sulphide in case 8. He had seen large manganese sulphide segregations with dark bands across the dove-coloured sulphide, which he took to be slag. Thus when the large segregations mentioned showed the "typical" dove colour, he jumped to the conclusion that they were sulphide. Despite the insolubility of iron phosphide in hydrochloric acid, he had saved many large, highly phosphoric castings in the manner suggested, whichever constituent was dissolved. He was afraid that outside measurements of the cylinder mentioned had not been supplied to him, and he thought such a small enlargement would be very difficult to measure except between machined faces.

Nottingham Section.

Meeting held at Nottingham, on Wednesday,
January 27th, 1915.

MR. J. T. WOOD IN THE CHAIR.

NOTE ON THE ADDITION OF FAT TO TANNIN EXTRACTS.

BY PURAN SINGH

(Chemical Adviser, Forest Research Institute,
Dehra Dun).

Some of the cheaper tannin extracts, such as mangrove, have two great defects, viz., their deep red colour and harsh tannage. The best way to overcome the colour difficulty lies in the judicious mixture of pure, unadulterated extracts with light-coloured tanning materials in the tannery. But very little seems to have been done by the tannin extract manufacturers to overcome the defect of harsh tannage. The last portion of this paper embodies the results of experiments carried out to overcome this defect. The suggestion came from the work carried out in connection with the fat content in tan barks which forms the first part of this paper.

The probable rôle of fat in tan barks.

It has been noticed that well-known tanning materials giving soft tannage contain naturally more fat than others giving harsh tannage, as is shown in the following table. The air-dried barks were finely powdered and extracted with hot petroleum spirit till they were free from fat. The following were the results obtained :—

Name.	Moisture.	Tannin.	Total petroleum spirit extract.
	%	%	%
Materials giving harsh tannage—			
Sal bark (<i>Shorea robusta</i>)	10-60	8-55	0-14
<i>Terminalia tomentosa</i> bark	8-70	10-76	0-18
Mangrove extract	13-43	70-20	0-03
Materials giving soft tannage—			
Mangrove (<i>Rhizophora mucronata</i>) bark	10-31	23-42	0-26
Gambier, 1st sample	12-42	42-48	0-82
Gambier, 2nd sample	13-0	—	1-58
Oak (<i>Quercus inana</i>) bark	9-3	13-94	0-26
Babul (<i>Acacia arabica</i>) bark	10-20	11-17	0-36
Do. do. pods	9-80	16-96	0-42
<i>Cassia auriculata</i>	10-8	16-86	1-08
Myrobalans	8-75	51-69	0-25

* Catechin.

† Tannin.

It is thus seen that the tan barks which are known to give harsh tannage contain less fatty matter than those giving soft tannage, nevertheless the ability of certain tanning materials to give soft tannage may be influenced by several factors, of which fat may be only one. Whether the fat in the bark has any influence on the hide during tanning can be gathered by observing whether the fat emulsified into the tan liquor gets absorbed by the leather, and whether the hide when partially tanned and kept in prolonged contact with bark actually absorbs fat from the finely powdered tanning materials in contact. Repeated extraction with water does not remove fat from the bark. The following table gives the fat contents of the materials mentioned above when their tannin has been removed by repeated extraction with water, and after drying the residue and extracting it with petroleum spirit. The results are in fair agreement with those obtained

by direct extraction with petroleum spirit, but, in some cases there is a slight increase, which may be due to the elimination of tannin. It seems that the fat occurring in the barks is not emulsified with water and so there is no likelihood of its being absorbed from the water extract by the hide. An additional proof is afforded by the mangrove extract. It gave to petroleum spirit only 0-03%, which shows that in the process of tannin extraction, the fat is not extracted by water from the barks.

No.	Name.	Moisture.	Fat.
		%	%
1	Sal bark	10-60	0-19
2	<i>Terminalia tomentosa</i> bark	8-70	0-20
3	Mangrove bark	11-70	0-30
4	Oak bark	9-30	0-30
5	Myrobalans	9-40	0-19
6	Babul bark	10-20	0-32
7	<i>Cassia auriculata</i>	10-80	0-82

The absorption of the fat by the hide during tanning is quite evident in the case of gambier. The fat in the gambier becomes suspended in water when the material is dissolved, and is absorbed by the hide along with tannin. This fact is supported by the experiments of Garelli and Apostolo (see this J., 1913, 877), showing that insoluble fatty acids simply suspended in water are fixed by skin and tan just as efficiently as when dissolved in alcohol or emulsified in water with ammonium soaps.

The fact that gambier yields soft tannage may be due to its fat content. Experiments were made to see if fat is similarly absorbed by the hide from various other materials. Small pieces of hide (8 grms.) were freed as far as possible from superficial fat by repeated extraction with petroleum spirit and then kept for about forty days in contact with fine powder of different tanning materials in quantities calculated to contain 2 grms. of tannin. The results are tabulated below :—

Material.	Quantity of the tanning material taken, grms.	Petroleum spirit soluble in the tanning materials taken, %	Total fat in the leather obtained, %	Net amount of fat absorbed, %	Percentage of fat absorbed out of total petroleum spirit extract.
Mangrove extract	3	0-0009	0-017	Nil	Nil
Sal bark	12	0-0024	0-017	Nil	Nil
<i>Terminalia tomentosa</i>	18	0-0324	0-018	0-001	2-7
Oak bark	14	0-0368	0-020	0-003	8-3
Babul bark	16	0-0576	0-027	0-010	17-4
Babul pods	10	0-0420	0-020	0-003	7-1
<i>Cassia auriculata</i>	11	0-1188	0-022	0-005	4-2
Mangrove bark	5	0-013	0-023	0-006	16-0
Control: pure tannic acid	2	—	0-017	—	—

These small scale experiments cannot be said to be conclusive, as a certain amount of experimental error is unavoidable. It will be seen, however, that the leathers absorbed more fat from the materials giving soft tannage than from those tanning harsh. The percentage of absorbed fat indicates the quality of the fats so far as their absorption by hide is concerned. These results indicate that the hide might in the prolonged process of tanning absorb fat direct from the barks, but it is difficult to say to what extent this absorption really takes place in the tan-pit. In the old process of tanning by contact with barks for several months, it is possible that the fat might have a softening action on the resulting leather. Whether the fat content of the bark

plays any part in the tan-pit or not, the co-occurrence of fat with such tanning materials as give soft tannage suggests that, possibly as the results of certain metabolic processes in the tree, the tannin accompanied by a certain quantity of fat has the property of giving soft tannage. On the other hand, myrobalans do not contain much fat and yet they tan soft.

Suggested addition of fat to tannin extracts.

The above results suggested the addition of fat to tannin extracts of all kinds in order to reduce the harshness of tannage. Experiments were therefore carried out to see whether the addition of fat to tan-liquors made from solid tan extracts does actually influence the result. The simultaneous absorption of traces of fat along with tannin by hide cannot but be useful in giving soft leather of better texture, if the presence of fat does not retard the tanning process.

Six pieces of hide well-limed, washed, and cut into equal sizes of 12 in. by 8 in., were put in stoppered bottles together with 1 litre each of the tan liquors (2% tannin) made from the solid tan extract of mangrove, sal bark, and myrobalans. In three bottles no fat was added, and in the other three 10% of fat (oil of the seeds of *Schleichera trijuga*) calculated on the tannin content, was added, and all the six pieces were tanned under similar conditions. All the pieces took the same time to be struck through. They were then taken out, thoroughly washed till free from excess of tannin, dried in the shade, equally stretched, and finished off. They were not fat-liquored.

The results obtained are tabulated below:—

No.	Name.	Description of the leather obtained
1	Mangrove with fat ...	Softer and with better texture than No. 2.
2	Do. without fat	Hard though not cracky
3	Sal with fat.....	Distinctly softer and with better texture than No. 4.
4	Do. without fat	Hard though not cracky
5	Myrobalans with fat ..	Soft, hardly distinguishable from No. 6. Texture and surface feel better.
6	Do. without fat	Soft leather.

It will be seen that an addition of fat to the tan-liquors made from the extract improves the leather without retarding the process of tanning, and that the simultaneous absorption of traces of fat, along with tannin, by the hide softens the resulting leather; this effect on the texture of the leather cannot be produced by subsequent fat-liquoring. It seems that the property of tannin extracts which give harsh tannage is somewhat mellowed down. Moreover, the addition of fat would have a protective action on tannin and thus avoid to a great extent the loss of tannin that takes place in tannin extracts on storage. It is therefore suggested that trials should be made in this direction by manufacturers of tannin extracts. Even in case of extracts of such materials as myrobalans, it is preferable to add fat which will have a protective action on tannin, irrespective of the question of the softening action.

The oils and fats ordinarily used for fat-liquoring could be used for the purpose, but it is preferable to have a mixture of oil and fat of the consistence of treacle. About 10% of fat calculated on the tannin content should be added to the vacuum pan, where it should get thoroughly emulsified with the tan-liquors. This fat will be available in a partly emulsified form when the solid extract is made into liquor in the tan-pit or the tanning drum.

DISCUSSION.

In reply to questions, the CHAIRMAN said that hitherto fat had always been applied to thick leathers, such as hides, by currying; in this process the dry skin was immersed in melted fat, or the fat was put on the surface of the moist leather and allowed to penetrate slowly. "Fat-liquoring" was applied to light leathers immediately after tanning: neatsfoot oil was used for the purpose. The addition of fat to the extract in the drum during the tanning process was practised already in certain cases.

Professor PROCTER wrote that the paper was interesting and the idea of using oil appeared practical, though not quite new, especially in drum tannage. He thought drumming with a fat emulsion (sulphated oils) and an extract might also give a very good "raw hide" leather.

Scottish Section.

Meeting held at Glasgow on Tuesday, 27th October, 1914.

MR. ROBERT HAMILTON IN THE CHAIR.

METHOD OF ESTIMATING THE VOLUME OF SOLID MATTER IN MUDS.

BY W. H. COLEMAN.

Some time ago the author was confronted with the following problem: Cyanogen was being recovered from coal gas by passing the gas through a mud obtained by adding ferrous sulphate to gas liquor. The cyanogen liquor obtained consisted of a muddy liquid in which some of the cyanogen was present in the solution as ammonium ferrocyanide and some in the solid form as a complex double ferrocyanide of iron and ammonia. This was contaminated by ferrous sulphide, tarry matter, and other bodies. It became necessary to know how much of the total cyanogen was in the soluble and how much in the insoluble form, and as it was found impossible to filter off and dry the mud without altering its composition, it was not at first quite easy to do this. Finally the following method was adopted and was found to give fairly concordant results. The muddy liquid was well shaken, measured out, and allowed to settle, and the ammonium ferrocyanide determined in the clear liquid: this was called A. To another equal portion of muddy liquid 50 c.c. of water was added, the mixture was well shaken and allowed to settle, and the ammonium ferrocyanide determined in the clear liquid (B). The total $(\text{NH}_4)_2\text{Fe}(\text{CN})_6$ contained in the original muddy liquid was determined (C).

The calculation was made as follows:—

Let x = the number of c.c. of liquid in the 50 c.c. mud taken for (B) before dilution, then as 50 c.c. of water was added, $(50+x)$ is the number of c.c. of liquid in the 100 c.c. after dilution, and this would contain the same total amount of ferrocyanide as was contained in the x c.c. before dilution, provided of course none of the insoluble ferrocyanide went into solution on dilution.

$$\therefore (x \times A) = (50 + x) B$$

$$\text{whence } x = \frac{50 B}{A - B} \text{ c.c.}$$

Then $50 - x$ c.c. = volume of solid matter in 50 c.c. of the original mud.

Of course if the quantities were weighed out instead of being measured the weight of solution and of dry solid matter would be obtained.

To calculate the distribution of the ferro-cyanide was then simple.

The conditions necessary for the determination to be accurate are:—The solid matter must be quite insoluble and must not be rendered soluble or altered in amount by dilution. The liquid must contain some soluble substance that can be easily determined and which must not be altered by dilution; the phenomenon of adsorption must not occur.

Applications: The above method might be applied to muds such as vat waste, cyanogen liquor, sewage, etc., and in many cases where an approximate result only is required it is only necessary to determine the decrease in sp. gravity caused by the dilution; to insoluble muddy deposits in solutions for crystallisation; and in volumetric analysis to ascertain the volume of a precipitate when a portion of clear liquid is taken for analysis.

The process is also applicable to the determination of naphthalene or "creosote salts" in creosote. The creosote is heated till quite liquid and the nitrogen determined by Kjeldahl's method. The creosote is then cooled and allowed to crystallise and some of the clear oil filtered off. The nitrogen is determined in this clear oil and from these results the volume of the deposited naphthalene can be calculated.

Communication.

NOTES ON GLASS.

National Physical Laboratory, February, 1915.

A certain amount of experimental work on glass-ware of various kinds has been carried out recently at the National Physical Laboratory, and it may be of interest to make known some of the results.

Chemical investigations have for some years been dependent on German glass; the publication of the analyses and of test results may, it is hoped, lead some English firms to produce articles which may replace those of German manufacture.

The subjoined table gives the analyses of some thermometric and chemical glass-ware.

Resistance of chemical glassware to chemical attack.

The table below, taken from the work of Mylius and Foerster on this subject, gives the action of various chemical reagents on glass used for chemical purposes (for analyses, see below).

Beakers.

Type of glass.	Water.		H ₂ SO ₄	NaOH	Na ₂ CO ₃
	20°	80°			
"R"	0.0054	0.0144	0	41	23
Jena	0.0071	0.0035	0	53	19
Bohemian	0.118	0.219	5	37	49

Flasks.

Type of glass.	Water.		H ₂ SO ₄	NaOH	Na ₂ CO ₃
	20°	80°			
"R"	0.0128	0.0128	0	51	26
Jena	0.0063	0.0057	0	63	24
Bohemian	0.093	0.255	11	62	70

The figures are in milligrams per sq. cm.

The solutions, viz., 2N.NaOH and N.H₂SO₄, were allowed to act at 100° for 6 hours, and 2N.Na₂CO₃ for 3 hours.

The Jena glass used was probably of the composition given under description "Original." This glass is not now used, but has been replaced by the "New Jena Glass," a special feature of which was its increased resistance to attack, which was brought about by long exposure to sulphurous gases. Soon after the introduction of this New Jena Glass by Schott und Gen., viz. in 1910, some tests were made at the N.P.L. The tests on the glass before and after the treatment with sulphurous gases are tabulated below. Several kinds of vessels were tested; the results for all were substantially the same.

Tests on "New" Jena Glass.

- Mark: (1) No annealing.
(2) Ordinary annealing.
(3) Special annealing in sulphurous gases for 36 hours.

Beakers.	Mgms. Na ₂ O per sq. cm. given up to water:	
	at 20° C. in 1 week.	at 80° C. in 3 hours.
1	0.0022	0.0045
2	0.0032	0.0017
3	0.0019	0.0040

Analyses of thermometer and chemical glassware.

	Thermometer glasses.		Schott und Gen., Jena.		Chemical glassware.		
	Jena 53"	Jena 16"	Original.	"New."	Resistance. "R."	Kavaller's Bohemian.	Thuringen.
SiO ₂	72.86	60.58	66.74	64.80	68.00	76.02	74.86
Al ₂ O ₃	6.24	3.84	2.77	6.24	2.32	0.44	0.90
CaO	0.35	7.18	0.28	tr.	4.80	7.38	9.40
ZnO	—	6.24	8.28	10.43	2.40	tr.	tr.
MnO	tr.	0.28	0.65	tr.	0.14	tr.	tr.
Fe ₂ O ₃	tr.	tr.	tr.	tr.	tr.	tr.	tr.
PbO	—	—	—	—	—	—	—
Na ₂ O	9.82	14.80	8.99	9.71	10.17	7.60	14.83
K ₂ O	0.10	tr.	0.08	tr.	1.82	7.70	0.14
B ₂ O ₃	16.43	0.91	7.18	8.70	5.63	—	0.16
MgO	0.20	0.17	4.50	0.32	5.04	0.80	—
As ₂ O ₃	—	—	—	—	0.24	—	—
	100.00	100.00	99.47	100.00	100.46	99.64	99.79

Analyses marked with an asterisk have been made at the N.P.L. The other analyses are taken from a paper by Walker (J. Amer. Chem. Soc., 1905, 27, 866).
(Bohemian and Thuringen glass is now rarely used in chemical work, but the analyses given are of the best material of that class.)

Loss in weight in mgrms. per sq. dcm.				
	3 hours with 2N NaOH at 100° C.	3 hours with 2N Na ₂ CO ₃ at 100° C.	6 hours with N H ₂ SO ₄ at 100° C.	
Beakers				
1	51	9	nil.	
2	51	8	nil.	
3	55	7	nil.	
Conical flasks.				
1	63	8	nil.	
2	60	11	nil.	
3	71	10	nil.	
Flat-bottomed flasks.				
1	62	8	nil.	
2	71	8	nil.	
3	79	6	nil.	

There was a small improvement as regards resistance to the attack of water, but no improvement to the attack of alkalis. Since its introduction this type of glassware has been used in the N.P.L. and has given every satisfaction.

In the estimation of zinc and manganese, especially in silicate analyses, it is necessary to employ solutions containing alkali chlorides and ammonium sulphide and to allow the solutions to stand at a rather high temperature (50°—60° C.) for some times as long as 12 hours. In these circumstances the glass is invariably attacked, and although no quantitative experiments have been made with the Jena glass, the resistance to the attack of these solutions is certainly not as good as with alkaline solutions in the absence of chlorides and sulphides. In view of the fact that glass flasks have to be used for this purpose, it seems desirable to devise a test, in addition to the tests usually carried out, to determine the ability to withstand the joint action of alkali chlorides and sulphides.

The New Jena Glass examined at the N.P.L. in 1910 possessed in a very high degree the ability to withstand sudden change of temperature. A glass flask filled with molten paraffin wax at 250° C. broke when placed suddenly in water at 15° C., but only after successfully standing such a test at slightly lower temperatures.

Another question which is engaging attention is glass for miners' lamps, incandescence lamp chimneys, steam gauge tubes, and other purposes in which a gradient of temperature is established between the inside and outside.

Analyses of some of these are given in the following table:—

Analyses of lamp glasses.

	Jena incandescence gas (Schott & Gen.), best quality.	Miner's lamp glass, German make, mark A B.	Miner's French lamp glass (yellow).	Miner's French lamp glass (colourless).	Austrian lamp glass, "Sun Brand."
SiO ₂	73.88	74.28	51.26	54.92	76.78
Al ₂ O ₃	2.24	3.24	6.90	1.28	0.72
CaO	tr.	tr.	tr.	tr.	6.82
ZnO	tr.	tr.	7.16	0.82	—
MnO	tr.	tr.	tr.	tr.	—
Fe ₂ O ₃	tr.	tr.	tr.	tr.	—
PbO	tr.	tr.	tr.	tr.	—
Na ₂ O	—	—	27.54	31.93	—
K ₂ O	0.67	0.73	tr.	2.08	11.14
B ₂ O ₃	tr.	tr.	3.87	4.54	4.74
MgO	16.48	15.02	3.67	—	—
As ₂ O ₃	tr.	tr.	tr.	0.20	0.24
Sb ₂ O ₃	0.73	0.73	—	0.99	—
SnO ₂	—	—	0.50	—	—
	100.00	100.00	100.00	99.76	100.14

It appeared, however, from Hovestadt's book on glass, and other information, that the additional

strength of the German glass was conferred on it in great measure by its heat treatment, and tests were made to investigate the state of strain in the glass.

For this purpose the following glasses were examined:—

(1) A miner's lamp chimney of white glass of German manufacture.

(2) A miner's lamp chimney of yellow glass of French manufacture.

(3) A piece of "Durax" tubing as used for chemical purposes.

From each of these tubes two rings of about 1 cm. depth were prepared by making transverse cuts across the tubes; the plane surfaces of the rings were optically polished. One ring of each specimen had a piece cut out so that the ring was free to spring. Other pieces were prepared for the determination of the refractive properties of the glasses.

The three open and three complete rings were examined in plane polarised light for strain. In both rings of the French glass, and in the open ring from the German lamp chimney, the amount of strain was negligible. In the unbroken ring from the German chimney there was very decided strain. Strain was also present in both rings of the Durax glass, the unbroken ring of this material showing much more pronounced strain than any of the other rings. The appearance presented by the rings when examined in the dark field is a very strong and sharp black circular line in the middle of the glass with a decided black cross upon it and the rest of the ring either white or milky.

The character of the strain present in the unbroken ring from the German chimney was determined by distorting the ring into an elliptical form by compression between two points at opposite ends of a diameter of the ring inclined at 45° to the plane of polarisation. By this means the milkiness could be made to disappear entirely from the regions about the diametral plane perpendicular to the line of compression, but the strain in the neighbourhood of the points of compression was increased. This shows that the strain is relieved by an increase in the curvature, and augmented by a reduction in the curvature; in other words, the inner layers of the ring are in a state of tension, and the outer layers in a state of compression. The fact that in the open ring the strain throughout is practically entirely relieved, suggests that these chimneys are made in one operation, and not by the combination of layers of material at different temperatures. It is evident that with the distribution of strain in the cold state indicated above, the chimney will tend to be relieved of strain when there is a radial temperature gradient throughout its substance with the outer surface cooler than the inner surface.

With the Durax tubing there is in neither ring freedom from strain. In the open ring the strain becomes worse on altering the curvature in either direction. Perhaps this indicates that the tube is built up of layers of the same or different materials, but brought together with one layer decidedly cooler than another. The presence of a thin white band in the substance of the glass may also indicate that the tube has been built up in the way suggested. An examination of all the rings in ordinary light showed the presence of striae likely to prevent the formation of really sharp spectrum lines in the determination of their refractive properties. This expectation was fully borne out by the appearance of the lines in the refractometer. No indication was obtained that any tube consisted of more than one type of glass, but the want of sharpness in the lines was sufficient to obscure the difference between glasses of very

nearly identical optical properties. The results obtained in these measurements are as follows:—

	n_D	$n_C - n_F$	v
German chimney	1.4795	.00729	65.8
French chimney	1.5748	.01313	43.8
Durax combustion tubing .	1.5156	—	—

The optical glasses which resemble the above in refractive properties are, for the German chimney one of the new "Fluor Crowns," for the French chimney a light flint, and for the Durax tubing a hard crown.

Experiments were made to determine possible variations in the strained condition of lamp chimneys due to internal heating and resulting temperature gradient across the glass.

Coils of wire were wound round a cylindrical metal core, the whole enclosed in asbestos paper and fitted closely (without mechanical strain) into the ring of the chimney examined. A thermocouple was introduced between the lagging and the glass to enable the temperature of the latter to be determined on the passage of a current through the heating coil.

French chimney. This was initially without strain. On heating, strain was found to develop progressively as the temperature rose, and there is no evidence that at any temperature the strain declines to a minimum again.

German chimney. When cool and at uniform temperature this showed very decided strain in the shape of a central ring and cross. On heating up the ring the strain was relieved, but the glass is never entirely freed from the strain as evidenced by a complete absence of the stauroscopic figure. The tendency is rather for the central dark ring to move outwards and to be replaced eventually by another ring moving out from the inner surface of the glass ring. There is nevertheless a decided minimum effect, i.e., minimum strain, obtained when the temperature of the inner surface of the glass ring is about 150° C. ($\pm 20^\circ$). The temperature gradient across the glass is such that in the

steady state the temperature of the outer surface of the lamp, corresponding to the above internal temperature, is roughly 70°, within the same limits of accuracy. Excessive heating above these limits results merely in producing a more pronounced strain. A further chemical analysis confirmed the view that the German miners' lamp chimney is of a single material.

The incandescence lamp chimneys are very thin and optical examination is not possible, but it appears fairly certain that in their case also the extra strength is attained by some process whereby the outside is chilled before the interior cools down. It seems possible also that the extra heat-resisting qualities of certain beakers, flasks, etc., of German glass may be due to the converse process, the interior being chilled previously to the exterior. All these glasses appear to be of the borosilicate type, such as is used for the well-known thermometer glass 59°", but with somewhat more boron anhydride; the chemical glass contains zinc oxide, which is absent from the thermometer glass.

Obituary.

JOHN NORTHING.

The Society has lost one of its original members by the death, on Feb. 17th, of Mr. John Northing, of Wicklow. He was one of the now rapidly diminishing number of chemists of the Liverpool and Widnes district who joined together and formed the nucleus of this Society. For some years he was engaged with the Runcorn Soap and Alkali Co. and with Messrs. Wigg Bros. and Steel of Runcorn; later he crossed to Ireland to manage the works of Messrs. Boyd and Co., of Dublin, and for the past 21 years he was General Manager of the Dublin and Wicklow Manure Co.

Journal and Patent Literature.

PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

English.—6d. each, to the Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

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I.—GENERAL PLANT; MACHINERY.

PATENTS.

Gases and vapours; Metallic beds or layers for separating impurities from— [or for condensing tar]. H. A. A. J. Lelarge, Paris. Eng. Pat. 10,394, Apr. 27, 1914.

THE gas is passed through a casing packed with metal strips wound in helical coils and coated with a viscous liquid, the coils in alternate layers being at right angles. The apparatus may be used for separating oils from exhaust gases or steam, or for condensing tar.—W. F. F.

Calcining kilns. J. A. Owen, Banbury. Eng. Pat. 14,959, June 23, 1914.

A CHAMBER formed in the foundations of the kiln is supplied with a forced draught of air through several radial channels. Above the chamber is a perforated cone which projects upwards into the

kiln. The discharge openings at the base of the kiln are provided with shoots and with doors or dampers, so that the forced draught may be supplemented by natural draught.—W. H. C.

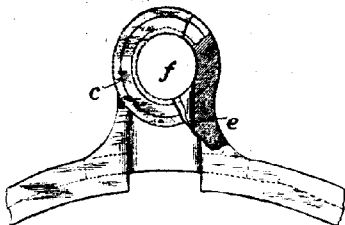
Gases; Method of separating— H. D. Gue, New York. U.S. Pat. 1,123,867, Jan. 5, 1915. Date of appl., Dec. 11, 1913.

A MIXTURE of gases of different densities is formed into a vortex, which is revolved at a high velocity. The mixture is supplied to the vortex at about the same velocity as that at which the latter is revolving, and the heavier and lighter gases are withdrawn respectively from the peripheral portion and the central portion of the vortex.—A.S.

Filter-press plate. R. Haag. Ger. Pat. 276,806, Sept. 26, 1913.

THE lug projecting from the periphery of the plate (see fig.) is provided with a groove, c, for the packing ring and with radial channels, d,

leading from the central opening, *f*, to the interior of the press. The lug is made as a separate



casting fitting exactly in a recess in the periphery of the plate, the whole being encased with vulcanite. —A. S.

Slimes, vinasse, and similar materials; Apparatus for dehydrating — E. Tehen. Ger. Pat. 278,258, Sept. 16, 1913.

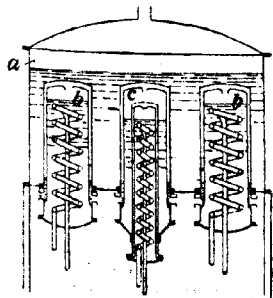
A DRUM with perforated periphery over which filtering cloth is stretched, and the interior of which is connected with a suction device, is rotated whilst dipping into the material. The perforations open into grooves formed in the outer surface of the drum, and the perforated wall has raised portions at the ends. The filtering cloth is stretched over these raised portions and clamped by the imperforate end walls of the drum, thus serving as packing material for the joints. On applying suction, the filtering cloth is drawn in, forming a trough of U-shaped section. —A. S.

Separating undissolved substances from liquids and simultaneously drying them. F. Berghauer. Ger. Pat. 278,883, Sept. 26, 1913.

A LIQUID containing undissolved solids in suspension, *e.g.*, slime, is passed through a hollow rotating drum, the walls of which are made, in part or entirely, of filtering material. The drum is mounted in a casing divided into two compartments by longitudinal partitions extending from its inner surface to the periphery of the drum. Air or, preferably, hot waste gas is drawn into one compartment, then through the permeable wall of the drum, first inwards and then outwards, and out through the other compartment. The current of gas serves to draw the liquid through the filtering material, to dry the deposited solids, and to clean the filtering material. —A. S.

Evaporating apparatus; Multiple-stage — with concentric evaporating and distilling chambers. O. Schmeisser. Ger. Pat. 276,952, Jan. 12, 1913.

SEVERAL evaporators, *b*, *c*, are arranged within a vessel, *a*, which acts as the last "effect" of the



apparatus, their lower ends projecting below the base of the larger vessel, in order to obtain a larger

heating surface and facilitate cleaning. By this arrangement the number of effects can be increased without a corresponding increase in the surfaces from which loss of heat by radiation occurs. To increase the capacity of the apparatus, the number of smaller evaporators within the large vessel may be increased, or an evaporator consisting of one evaporating and one distilling chamber, as at *b*, may be replaced by one containing several concentric evaporating and distilling chambers, as at *c*. —A. S.

Distilling column. A. Gasser. Ger. Pat. 278,257, Sept. 18, 1913.

THE apparatus consists of vertical, tubular chambers arranged side by side, with intermediate heating elements, and it is divided into sections connected together by flanged joints and mounted on rails, so that any section can be readily removed to be cleaned, repaired, or replaced. —A. S.

Evaporating apparatus. E. Kuhnke, Leverkusen, Germany, Assignor to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,126,491, Jan. 26, 1915. Date of appl., Aug. 14, 1913.

SEE Eng. Pat. 15,624 of 1913; this J., 1914, 126.

Apparatus for raising liquids, especially sulphuric acid. Ger. Pat. 279,074. See VII.

Expressing oil, juice, or fluid from seeds, nuts, fruit, fish, etc., and producing shaped blocks from plastic materials and the like. Eng. Pat. 501. See XII.

Apparatus for separating emulsions, especially for separating fat from glue solution. Ger. Pats. 277,281 and 278,891. See XV.

IIA.—FUEL; GAS; MINERAL OILS AND WAXES.

Coal; Analysis of —, with phenol as solvent. S. W. Parr and H. F. Hadley. Illinois Univ. Exp. Stat., Bull. 76. J. Gas Lighting, 1915, 129, 260.

By treatment with phenol at 110° C. for 20 hrs. in an atmosphere of carbon dioxide, 35–40% of the coal substance was extracted from high-volatile coals (Vermilion County), and 20–30% from low-volatile coals (Williamson Co., U.S.A.). In each case the residue was non-coking, the extract containing the coking constituents and the greater proportion of volatile matter. Both residue and extract absorbed oxygen and water readily from the air at ordinary temperature, the residue showing the greater avidity; the oxygen absorbed is regarded as chemically combined. Coal, extract, and residue were practically the same in elementary composition; the gases obtained by destructive distillation of the three materials were also of similar composition. Oxidation was found to decrease the proportion of volatile matter obtainable from coal, residue, and extract, and also the amount of material removable from coal by solution in phenol. No chemical change was observed either in the phenol itself or in the components of the coal. —W. E. F. P.

Bomb calorimetry; Corrections in —. G. N. Huntly. Analyst, 1915, 40, 41–48. (See also this J., 1910, 917–921.)

CORRECTIONS are considered under the following headings:—*Thermometer tube (calibration).* If a good thermometer be used without a calibration

table, the errors may amount to one unit of division (i.e. 0.01° with a thermometer reading to 0.01°). *Fuse.* The use of thick wires and high voltages should be avoided. The heats of fusion and combustion of the fine platinum wire (0.002 in. diam.) and cotton thread ordinarily used amount to about 5 and 20 calories, respectively. *Cooling.* The Regnault-Pfaundler correction should be applied for accurate work. This expression (which is the only formula taking into account errors due to evaporation from the calorimeter vessel and the heat evolved by the friction of the stirrer) represents the approximate integration of the time-temperature curve and may be much simplified, without loss of accuracy, by adjusting the experimental conditions so that curves of similar shape are always obtained; the shape of the curve depends on (1) the heat conductivity of the walls of the bomb, which is constant for a given instrument, (2) the rate of stirring, which is the predominant factor and may be made constant (preferably 120 oscillations per min.), and (3) the velocity of combustion, which for coals in the same state of aggregation (i.e. briquetted or not), or for oils and pure organic substances, may be regarded as practically constant. *Temperature coefficient.* Correction should be made for changes in the water equivalent of the apparatus (unless used in a constant-temperature chamber) and also, when a thermometer of the Beckmann type with variable zero is used, for variations in the value of the degree with temperature. These corrections are conveniently combined by determining the water equivalent, at regular temperature-intervals, by combustion of a pure substance, preferably benzoic acid. *Sulphur and nitric acid.* In the usual method of determining this correction (titration of total acidity, followed by precipitation with barium chloride), the acid solution obtained in an enamel-lined bomb provided with a lead washer is liable to contain minute, transparent particles of enamel and appreciable quantities of lead nitrate and sulphate. Errors due to the presence of these substances may be avoided by boiling the acid solution with a measured excess of standard sodium carbonate, filtering, titrating back with standard acid, and then precipitating with barium chloride. The usual practice of subtracting 22.5 calories for each 1% S found, is based on the assumptions that the sulphur is completely oxidised to sulphur trioxide in the bomb, and that in practice the sulphur in the fuel is converted entirely into sulphur dioxide; the first assumption is substantially accurate but the second is not. *Heat loss by evaporation.* This error is eliminated by the Regnault-Pfaundler correction, but not in methods of adiabatic calorimetry unless the calorimeter vessel is enclosed in an airtight manner. *Incomplete combustion.* The large fused globules of ash produced by the combustion of some (briquetted) coals in the bomb almost invariably contain enclosed particles of unburnt carbon; the latter should be determined by combustion of the powdered ash with lead chromate and potassium bichromate, and allowed for. Results should not appear to indicate a greater degree of accuracy than that warranted by the experimental conditions; with uncalibrated thermometers reading to 0.005°, for example, errors of 200 B.Th.U. per lb. are quite possible; under the best conditions, having regard to the possibilities of constant and other errors, closer agreement than 30 B.Th.U. between duplicate determinations on ordinary fuels must be regarded as accidental.—W. E. F. P.

Gas; Fractional combustion of—over copper oxide. E. Terres and E. Mauguin. *J. Gas Lighting*, 1915, 129, 257–258.

HYDROGEN is oxidised almost completely at 250°–300° C., and dry carbon monoxide to the extent of

90–94% at 305° C. by copper oxide; mixtures of hydrogen and carbon monoxide in approximately equal quantities are completely oxidised at 300° C. Owing to deposition of carbon on the copper oxide, the combustion of heavy hydrocarbons (acetylene, ethylene, and benzene) is incomplete at 300° C., even in the presence of hydrogen. Methane begins to oxidise at 310° C. (slightly lower in presence of hydrogen) and is completely oxidised at a red heat, when in high proportion in the mixture, but only partly when in quite small proportion; hydrogen has no influence on the combustion of methane at a red heat. Mixtures containing hydrogen, carbon monoxide, and methane in the approximate proportions of 1:1:2, respectively, can be separated quantitatively by fractional combustion by copper oxide at 300° C., but this method is not applicable to mixtures of carbon monoxide and methane alone.—W. E. F. P.

Acetylene; Action of—upon metals. H. Reckleber and J. Scheiber. *Chem.-Zeit.*, 1915, 39, 42.

OF a series of metals and alloys including zinc powder, tin powder, lead filings, iron powder, copper powder, nickel powder, brass, tombac, German silver, phosphor-bronze, aluminium-bronze, bronze, type-metal, and solder, none was affected by the continuous passage of pure dry acetylene during 20 months; with pure moist acetylene nickel increased in weight by 0.9% and copper by 1.0%. During the same period the unpurified moist gas (generated from commercial carbide) had no appreciable action on tin, tombac, German silver, aluminium-bronze, type-metal, or solder; zinc, lead and brass gave increases in weight of 0.4% to 0.9%, iron 6.4%, bronze 6%, and phosphor bronze 14.4%. In six months copper powder had completely blackened and increased in weight by 92%; copper foil showed an increase of 80% after 12 months; acids acted upon the material producing traces of hydrogen sulphide but not acetylene, and the black residue resembled the carbonaceous product obtained by the action of acetylene on copper salts. A very similar deposit has been observed in copper tubes employed in acetylene installations. In no case were explosive substances produced. It is suggested that metal tubes, etc., subjected to continuous contact with acetylene should be coated with nickel or tin.—J.R.

Inflammable vapours and air; Speed of ignition of mixtures of— M. Hofsäss. *Karlsruher Chem. Ges.*, July 10, 1914. *Chem.-Zeit.*, 1915, 39, 64.

MIXTURES of air with the vapours of pentane, hexane, benzene, gasoline, and benzine, respectively, were tested, the speed of ignition being ascertained by determining the surface area of the inner cone of the flame (see *Ger. Pat.* 272,705; this *J.*, 1914, 685). It was found that the variation of the speed of ignition with changes in the relative proportions of inflammable vapour and air could be represented by a curve, which had a characteristic form for each different mixture and passed through a maximum. The maximum speed of ignition was higher, the lower the boiling point of the liquid from which the vapour was derived.—A. S.

Petroleum industry; Continuous and discontinuous refining in the— K. Mahr. *Z. angew. Chem.*, 1915, 28, 20–22.

IN the continuous refining process adopted in many works for the lighter petroleum fractions, the petroleum is passed through a series of six to eight lead and four to five iron cylinders which are half filled with concentrated sulphuric acid and 5% sodium hydroxide, respectively. The oil is obtained in a state of fine division by the use of sieve-plates or a coarse lump packing. Crude benzine, containing little unsaturated, sulphuretted

or oxygenated impurities, may be effectively refined in this way; but the heavier and less pure fractions should be treated according to the discontinuous process, in which, by means of mechanical stirring, much more thorough mixing is achieved.—J. R.

Gilsonite from the Philippines. Ch. of Comm. J., March, 1915.

A DEPOSIT of uintaite or gilsonite has been discovered a few miles inland from the west coast of the island of Leyte, near the northern end of the island. The deposit is said to lie between the towns of Villaba and Leyte. The occurrence is described as a vein or bed outcropping with a thickness of several feet across the floor of a gully, and apparently dipping into the hills on either side at an angle of 40°. Near the outcrop there is a petroleum seep from which a heavy oil escapes in small quantity. The following analysis of a representative sample of the deposit is supplied by the Bureau of Science of the Philippine Islands: Character, solid and brittle; colour, dull, brownish black; fracture, perfect conchoidal; hardness, 2; sp. gr., 1.026; penetration at 25° C., 6°; loss of weight at 103° C. for five hours, 3.28%; total bitumen (soluble in CS₂), 93.79%; organic insoluble, 1%; mineral matter, 5.21%; fixed carbon, 1.68%. It is considered equal to the gilsonite that sells for £2 to £4 per ton in the American market.

Use of carbide sludge in building. Schumann. See IX.

PATENTS.

Briquettes; Manufacture of—and apparatus therefor. J. Armstrong, London. Eng. Pat. 1188, Jan. 16, 1914.

FINE material, mixed with a binding medium such as tar, is charged from a hopper of V-section into two endless chains of moulds, travelling in opposite directions. When the moulds are filled, the two chains converge and are pressed and clamped together. They then pass downwards through a heated vertical tunnel, and on emerging from this the clamps are released, the chains diverge, and the moulds are emptied. The briquetting operation is thus performed automatically and continuously, out of contact with air, and under pressure of the expanding material.

—W. F. F.

Carbonaceous fuel. W. H. Aldrich, Pasadena, Cal. U.S. Pat. 1,124,382, Jan. 12, 1915. Date of appl., Feb. 26, 1912.

The compressed carbonized product of a mixture of gas retort carbon and asphaltic oil.—W. F. F.

Agglomeration of materials in powder or small fragments, especially coal; Process of—. E. M. Heckel. First Addition, dated Feb. 14, 1914, to Fr. Pat. 439,605, Jan. 26, 1912 (see this J., 1912, 710).

A PASTE of starch and water acidified with sulphuric acid is used as an agglomerant instead of glucose.—W. H. C.

Briquettes of anthracite, coke, lignite, etc.; Manufacture of smokeless—. A. Exbrayat. Fr. Pat. 470,949, June 28, 1913.

STRAWED is boiled with caustic soda solution and a little coal tar is added to prevent fermentation and an oxygen-yielding compound to prevent production of smoke on burning. The pasty mass thus obtained is used as an agglomerant in the manufacture of fuel and ore briquettes.

—W. H. C.

Coke-ovens; Horizontal—with vertical flues. Soc. Franco-Belge de Fours à Coke. Fr. Pat. 470,873, Feb. 7, 1914.

THE air is preheated by the waste gases in a regenerator composed of a system of flues through which the air and gas flow in parallel but opposite directions without any reversal of current. The heating gas enters the top of the vertical heating flues from a common main and is distributed at different levels where it meets the heated air. The latter passes upwards through vertical air flues and enters the heating flues through ports inclined downwards. The air receives a preliminary heating in a tubular heater through which the partially cooled waste gas from the regenerators passes. Blast furnace or producer gas preheated in a similar manner to the air may be used instead of coke oven gas for heating the ovens.—W. H. C.

Retorts; Vertical—for carbonising coal or the like. A. McD. Duckham, Ashtead, Surrey. Eng. Pat. 17,667, July 25, 1914.

PORTS for the escape of gases are arranged at different levels, and open into a flue which may be divided, by dampers, into compartments, each having an off-take and communicating with one or more ports. Heating or cooling flues similarly divided into compartments may be arranged on either side of the collecting flue.—W. F. F.

Vertical retorts for carbonising coal or the like; Apparatus for discharging—. A. McD. Duckham, Ashtead, Surrey. Eng. Pat. 17,668, July 25, 1914.

To discharge continuously a retort in which the charge is subjected to mechanical pressure, the retort is provided in the known manner, at the bottom, with an extension having a curved wall. Immediately beneath this is an endless chain belt travelling on two rollers, which discharges the coke into a gas-tight hopper.—W. F. F.

Lignite and coal together; Process for the carbonisation of—. W. Röder and A. Feust. Ger. Pat. 278,145, Dec. 21, 1913.

FINELY-DIVIDED lignite is added to from ten to twenty times its weight of coal and the mixture carbonised.—A. S.

Gas-producers; Air grates for—. A. W. Dixon, W. H. Pearson, and J. Brown and Co., Sheffield. Eng. Pat. 28,742 of 1913; date of appl., June 12, 1914.

THE upper part of the grate is rotated upon the lower fixed part and is provided at its periphery with lugs or projections which break up the ash and clinker.—W. H. C.

Producer or the like; Apparatus for aiding the operation of clinkering a—. A. McD. Duckham, Ashtead, Surrey. Eng. Pat. 1345, Jan. 17, 1914.

A TEMPORARY grate formed of bars connected by a crosshead slides on rails mounted on a wheeled carriage and is thrust into the clinker by a hydraulic ram, which may be the ram of a mechanical poker mounted on the same carriage and used for breaking the clinker. The grate may be reciprocated during its forward movement by the alternate compression and release of helical springs, and the grate bars may be water-cooled.—W. F. F.

Gas-producer. H. F. Wallmann, Assignor to A., W. R., and H. H. Wallmann, Chicago, Ill. U.S. Pat. 1,125,919, Jan. 19, 1915. Date of appl., July 20, 1908.

IN a down-draught gas-producer, raw fuel is fed into a distillation conduit, mounted above the

producer chamber and heated by the hot gases from the latter; steam is passed into the conduit and the distillation products, together with steam and air, are passed into the producer chamber, into which the fuel residue also falls by gravity. The gas from the producer passes through a passage surrounding the distillation conduit on its way to the outlet.—W. F. F.

Gas; Process of manufacturing—B. van Steenberg, Goshen, N.Y. U.S. Pat. 1,124,364, Jan. 12, 1915. Date of appl., May 6, 1911.

A gas with a high content of illuminants of the olefine series, is obtained by passing hydrocarbon oil or vapour over a refractory material, and a catalytic agent heated electrically from within, to 800°–850° F. (about 430°–460° C.). It may be mixed with gas obtained by passing steam and oil vapour over a refractory body and a catalytic agent heated to a temperature sufficiently high to decompose the steam.—W. F. F.

Carburetted water-gas; Manufacture of—O. B. Evans, Assignor to The United Gas Improvement Co., Philadelphia, Pa. U.S. Pat. 1,125,670, Jan. 19, 1915. Date of appl., Feb. 20, 1912.

THE "blows" of producer gas and "runs" of blue (uncarburetted) water-gas are passed successively in opposite directions through the carburetting chamber. The water-gas is carburetted alternately at different points in the chamber, and the producer gas is burnt alternately at points opposite those at which the previous carburation was effected, the combustion products and carburetted water-gas being withdrawn alternately at opposite ends of the chamber.—W. F. F.

Coke-oven gas; Utilisation of—and the recovery of by-products [ammonium nitrate] therefrom. T. Twynam, Redcar. Eng. Pat. 1820, Jan. 23, 1914.

THE excess of gas which is not required for the coke-oven plant is converted first into mechanical and then into electrical energy. The electrical energy so obtained is utilised to produce nitric acid from the air and the nitric acid is used to absorb the ammonia contained in the crude coke-oven gases to produce ammonium nitrate.—W. H. C.

Oils or spirits for use in internal combustion engines; Production of—B. O. Jenkins, Bristol. Eng. Pat. 3890, Feb. 14, 1914.

A DISTILLATE from coal tar or coke oven tar, e.g. benzol or naphtha (25, 33, or 50%), is mixed with a volatile alcohol (e.g. 74, 66, or 49% of ordinary alcohol) and about 1% of camphor, and the mixture distilled to obtain a fuel of high flash-point.—C. A. M.

Hydrocarbons or the like; Manufacture of light—P. Sabatier and A. Mailhe, Toulouse. Assignors to Soc. des Raffineries Catalytiques des Petroles et Hydrocarbures. Paris. U.S. Pat. 1,124,333, Jan. 12, 1915. Date of appl., Mar. 31, 1914.

LIGHT hydrocarbon oils, boiling below 300° C., are obtained by passing the vapours of heavy hydrocarbons over a metallic catalyst (nickel), maintained by means of an electric current at a temperature of 300° C. to red heat. The catalyst may be in a fine state of division and in contact with an electrically conductive metallic substance.—C. A. M.

Oils from natural oil-bearing earths or the like; Extraction of—E. Kaufmann. Ger. Pat. 278,279, Sept. 14, 1913.

THE extraction vessel is fitted with a sieve and the earth is kept in circulation by means of a screw or the like, which forces it upwards through the sieve

into the superincumbent solvent. An agitator rotates in the layer of solvent above the sieve, and one or more other agitators may be provided to mix the earth and solvent below the sieve. By the method described it is possible to treat satisfactorily calcareous or argillaceous earths which cake when brought in contact with a solvent for the oil.—A. S.

Lubricant [cylinder oil]; Production of a highly viscous—Zeller und Gmeln. Ger. Pat. 278,956, Sept. 20, 1913.

PETROLEUM pitch is extracted with a volatile solvent, such as benzene, chloroform, or benzine or other light hydrocarbon oil, the extract is purified in the usual way with sulphuric acid and alkali, washed with water, and the solvent distilled off. A liquid cylinder oil is obtained having a viscosity of 20° (Engler) at 100° C. and a flash point of 310°–315° C.—A. S.

Peat or other substances; Removal of moisture from—T. Rigby, Dumfries, Scotland, Assignor to Wetcarbonizing, Ltd., London. U.S. Pat. 1,124,954, Jan. 12, 1915. Date of appl., May 15, 1912.

SEE Eng. Pat. 16,958 of 1911; this J., 4912, 1114.

Oven for generating gas and producing coke. H. Koppers, Essen, Germany. Assignor to H. Koppers Co., Chicago, Ill. U.S. Pat. 1,125,345, Jan. 19, 1915. Date of appl., July 28, 1913.

SEE Fr. Pat. 460,517 of 1913; this J., 1914, 68.

Motor spirit from heavy hydrocarbons; Production of—W. A. Hall, New York. Eng. Pat. 24,491, Oct. 28, 1913.

SEE Fr. Pat. 467,381 of 1914; this J., 1914, 853.

Process of refining [hydrocarbon] oils. U.S. Pat. 1,125,422. See III.

Manufacture of ammonium sulphate from distillation gases. Ger. Pat. 277,379. See VII.

Saturator for the production of ammonium sulphate from distillation gases. Ger. Pat. 279,134. See VII.

Gas-analysis apparatus. U.S. Pat. 1,124,432. See XXIII.

II.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Animal charcoal of high decolorising power; Process for the preparation and revivification of—A. Zelnicek. Fr. Pat. 471,295, April 24, 1914. Under Int. Conv., May 2, 1913.

CARBONACEOUS materials are heated with a concentrated solution of zinc chloride until the latter commences to volatilise. The black carbonised residue is then washed free from zinc compounds. Spent animal charcoal may be mixed with cellulose or the like before being revived by the treatment described.—W. H. C.

Wires of hard metals [for electric lamp filaments]; Process for drawing—N. V. Philips Metaal-Gloeilampenfabrik. Ger. Pat. 278,278, April 6, 1913.

THE wire is drawn at a very low temperature attained by intense cooling of the wire, the lubricant, or the die.—A. S.

Arc lamp electrodes; Manufacture of—J. Hagen. Ger. Pat. 278,419, Oct. 1, 1913.

BROKEN coconut shells are carbonised and the charcoal made into electrodes in the usual way with the aid of a binding agent. A viscous liquid produced during the carbonisation may be used as binding agent.—A. S.

Ultra-violet rays; Production of—J. von Kowalski-Wierusz, Freiburg, Switzerland. Eng. Pat. 9046, April 9, 1914.

SEE Fr. Pat. 468,215 of 1914; this J., 1914, 971.

Production of an oil for heating or lighting from neutral tar. Ger. Pat. 277,502. See III.

Manufacture of ammonium sulphate from distillation gases. Ger. Pat. 277,379. See VII.

Saturator for the production of ammonium sulphate from distillation gases. Ger. Pat. 279,134. See VII.

III.—TAR AND TAR PRODUCTS.

Toluene in commercial solvent naphtha; Determination of the percentage of—H. G. Colman. J. Gas Lighting, 1915, 129, 314—315.

ONE hundred c.c. of the sample is distilled at the rate of one drop per second from a round-bottomed flask provided with a Young 12-bulb pear, or other efficient fractionating column, and the distillate up to 138° C. is collected. If this does not amount to 35 c.c., a second 100 c.c. is fractionated and the distillates are combined. If the combined distillates do not amount to 35 c.c. the sample is considered to be practically free from toluene. Otherwise 35 c.c. of the distillate is mixed with 50 c.c. of pure toluene and 15 c.c. of pure benzene, the toluene in this mixture is determined as described previously (see this J., 1915, 168), and the toluene content of the solvent naphtha is calculated.—W. H. C.

Water, phenol, and benzene; The equilibrium in the system—S. Horiba. Mem. Coll. Sci., Imp. Univ., Kyoto, 1914, 1, 49—55.

THE equilibrium state of the system at 25° C. is shown in a triangular diagram plotted from the experimental results given in the following tables:

Mixtures with two layers.

Upper layer.			Lower layer.		
Phenol.	Benzene.	Water.	Phenol.	Benzene.	Water.
%	%	%	%	%	%
0	99.95	0.05	0	0.198	99.802
4.73	94.98	0.24	1.43	0.21	98.36
17.38	81.83	0.81	2.80	0.21	96.60
21.15	77.22	1.03	3.01	0.21	96.77
26.01	69.81	2.18	3.35	0.21	96.44
44.39	50.56	5.05	4.07	0.19	95.74
55.89	36.13	8.07	4.58	0.19	94.18
74.5	3.0	22.5	5.65	0.17	94.18
76.71	0	23.29	8.195	0	91.805

Saturated solutions with phenol as solid residue.

Phenol.	Benzene.	Water.
%	%	%
81.06	18.04	0
89.78	7.92	2.30
92.31	4.07	3.62
95.14	0	4.80

—A. S.

Toluene; Bromination of—A. F. Holleman. Rec. Trav. Chim. Pays-Bas, 1914, 33, 183—191. Bull. Soc. Chim., 1914, 15, 783.

THERMOCHEMICAL study of the products of bromination of toluene in the nucleus, shows that only the *ortho*- and *para*-derivatives are formed. Pure *o*-bromotoluene melts at —27°, *p*-bromotoluene at +26.7°, and the eutectic mixture of the *o*- and *p*-derivatives at —37.3° C.—R. G. P.

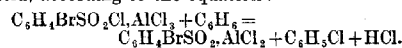
Coal tar products investigation in the United States.

Oil, Paint, and Drug Rep., Feb. 8, 1915.

MR. T. H. NORTON, formerly U.S. Consul at Chemnitz, has been appointed a commercial agent of the Department of Commerce to undertake a special investigation of the chemical industry in the United States, particularly in respect to coal-tar products. It is hoped that his report will be helpful in the development of synthetic dyestuff manufacture in the United States.

Friedel and Crafts reaction; Researches on—[Condensation of *p*-bromobenzenesulphonic acid with benzene and its derivatives.] S. C. J. Olivier. Rec. Trav. Chim. Pays-Bas, 1914, 33, 91—182. Bull. Soc. Chim., 1914, 15, 783—784.

A DYNAMIC study of the condensation of *p*-bromobenzenesulphonic acid chloride with benzene and its derivatives in presence of aluminium chloride. In carbon bisulphide solution no sulphone is formed as in benzene solution, but *p*-bromobenzenesulphinic acid, according to the equation:



As this reaction takes place in absence of carbon bisulphide in solutions to which traces of sulphur chloride (S_2Cl_2) are added, and more rapidly in carbon bisulphide solutions which have been kept than in fresh solutions, it is probable that the reaction is due to sulphur chloride, which retards the formation of sulphone. When aluminium bromide is used instead of the chloride a pale yellow, hygroscopic, crystalline compound, $\text{C}_6\text{H}_4\text{BrSO}_2 \cdot \text{AlBr}_3$ (decomposing at 125°—132° C.), is formed, with liberation of free bromine. Study of the formation of sulphone in solutions with benzene or its derivatives shows that the sulphonic acid chloride reacts only as an equimolecular compound, $\text{C}_6\text{H}_4\text{BrSO}_2\text{Cl} \cdot \text{AlCl}_3$; 1 mol. of aluminium chloride can only convert 1 mol. of sulphonic acid chloride, the constant of the reaction (when excess of aluminium chloride is not present) being proportional to the concentration of aluminium chloride; when excess of aluminium chloride is present the constant increases greatly. Velocity of reaction diminishes in the order— $\text{C}_6\text{H}_5\text{CH}_3$, C_6H_6 , $\text{C}_6\text{H}_5\text{Cl}$, $\text{C}_6\text{H}_5\text{Br}$, $\text{C}_6\text{H}_5\text{NO}_2$. These facts are interpreted by assuming that the acid chloride is activated in the compound, $\text{C}_6\text{H}_4\text{BrSO}_2\text{Cl} \cdot \text{AlCl}_3$, while the benzene is activated in proportion to the amount of aluminium chloride combined with the sulphonic acid chloride or sulphone. Free aluminium chloride is a most energetic catalyst.—R. G. P.

β -Naphthol; Reaction of—J. Katayama and B. Ikeda. Yakugakuzasshi, Oct., 1914. J. Pharm. Chim., 1915, 11, 73—74.

A VIOLET coloration is obtained when 1 c.c. of a β -naphthol solution is acidified with a few drops of concentrated sulphuric acid and mixed with 0.05 c.c. of a 0.01% sodium nitrite solution. The reaction is given by a solution containing 0.0002 gm. of β -naphthol per c.c., and is probably due to the formation of a quinonoid derivative of β -naphthol.—W. P. S.

Determination of very weak acids and bases by means of electric conductivity measurements. Horiba. See VII.

PATENTS.

[Hydrocarbon] oils; *Process of refining* — S. W. Whitmore, Cleveland, Ohio. U.S. Pat. 1,125,422, Jan. 19, 1915. Date of appl., March 28, 1914.

HYDROCARBON oils are mixed with naphthalene (500 to 800 lb. per 5000 galls.), and the mixture distilled.—C. A. M.

Tar; Production of an oil for heating or lighting from neutral — A. Markl. Ger. Pat. 277,502, July 9, 1913.

TAR of any kind is mixed with a very dilute, aqueous alkali solution, allowed to settle, and the tar separated and distilled; the oily fraction passing over after the water is a mobile liquid having a high calorific value, whilst the residue is an asphaltic pitch.—A. S.

Toluene; Manufacture of [nitro] derivatives of — J. Maire, Argenteuil, Assignor to A. E. Vergé, Vincennes, France. U.S. Pat. 1,124,496, Jan. 12, 1915. Date of appl., July 21, 1913.

SEE Eng. Pat. 17,128 of 1913; this J., 1914, 890.

Nitro-bodies; Process for the continuous reduction of aromatic — J. E. Marwedel, Uerdingen, Germany. U.S. Pat. 1,124,776, Jan. 12, 1915. Date of appl., Sept. 11, 1913.

SEE Fr. Pat. 426,006 of 1913; this J., 1914, 193.

Nitrosulphonylchlorides of ortho[hydr]oxycarboxylic acids and of their derivatives. R. Kothe, Vohwinkel, and O. Dressel, Mülheim, Germany, Assignors to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,125,124, Jan. 19, 1915. Date of appl., May 12, 1914.

SEE Eng. Pat. 12,061 of 1914; this J., 1914, 855.

Arylated naphthylaminesulphonic acids and process of making same. W. Hahnenkamm, Assignor to Farb. vorm. Meister, Lucius, und Brüning, Höchst on Main, Germany. U.S. Pat. 1,125,311, Jan. 19, 1915. Date of appl., Mar. 7, 1912.

SEE Fr. Pat. 440,879 of 1912; this J., 1912, 809.

Metallic beds or layers for separating impurities from gases and vapours [or for condensing tar]. Eng. Pat. 10,394. See I.

Production of oils or spirits for use in internal combustion engines. Eng. Pat. 3899. See IIA.

Manufacture of light hydrocarbons or the like. U.S. Pat. 1,124,333. See IIA.

IV.—COLOURING MATTERS AND DYES.

British manufacture of aniline dyes.

A DISCUSSION took place in the House of Commons on February 22nd on the subject of the Government scheme for the manufacture of aniline dye-stuffs.

Mr. A. H. PAGET said that there was probably not more than three months' supply of dyes in this country. The majority of traders thought that the only possible solution of the problem which the Government had to solve was to put a protective duty on dyestuffs after the war. He hoped the Government would also assist the manufacture of synthetic drugs. The present Government scheme was a distinct advance on the original one, but the £100,000 suggested for research was utterly inadequate, in view of the enormous sums spent in

Germany for a similar purpose. He asked what guarantee there was that the dyes required would be provided during the war. They understood that two at least of the factories in India had been compelled to close for want of the necessary chemical products. He asked whether the Indian Government had been consulted as to their participation in the scheme if the money were not found in this country. It was a question whether the duty on alcohol should not be removed for the purposes of the chemical trade, as it had been in Germany.

Mr. W. A. S. HEWINS said that the scheme would not enable them to get the dyes required. Some 3000 different dyes were used, and the £100,000 would not go far in laboratory experiments for the purpose of adapting the various dyes to the needs of manufacturers. If research were to be endowed, it should be on an adequate scale. He asked how the dye users were to be compelled to purchase from the National Company. In his opinion the Government proposals would introduce protection of the most objectionable type, analogous to the American tariff. If the Government afforded such protection to the dyestuff industry, it would be difficult for them to refuse it to other industries. He believed that, though it would not be possible to make by any means all the dyes that were being used, a very large number could be made shortly by using to the fullest extent the resources and potentialities of the country, and that in this way the difficulties of the situation could be overcome to a great extent. As regards general principles, the action of the Government should not be in the direction of State-ownership or State-running of the industry; it should be regulative and advisory. There were important dye factories in this country, as well as important chemical works which could produce dyes. If both dye and chemical potentialities were organised, he believed that the question could be solved. If the industry were to be made a success, it must be given security. If the Government were willing to give subsidies and bounties, they should not hesitate to consider the question of reasonable security. He did not regard such a scheme as this as leading to a scheme of Tariff Reform, but they would not get sufficient capital unless adequate security were promised.

Mr. T. C. TAYLOR considered that the best way to relieve British colour users was to facilitate the sending of raw material to and bringing it back from Switzerland. The colour manufacturers had been deprived of free alcohol, and the patent laws had not helped as they ought to have done. The principles of coercion and exclusion were blots on the scheme. He was willing to subscribe considerably if the five years' agreement were struck out.

Sir P. MAGNUS said the scheme seemed too ambitious for the period of the war only, and scarcely adequate for the period after the war. If the Government did not intend to help the industry after the war was over so that we might successfully compete with foreign producers, then it would be almost better to leave the scheme alone. But if the Government desired that we should be no longer dependent for dyestuffs on foreign manufacturers after the war, he hoped they would do what they could to secure for the industry an organisation not altogether dissimilar from that which at the present moment existed in Germany. The sum of £10,000 a year for ten years for scientific research was under those circumstances absolutely inadequate for the purpose. At the present time there were over one thousand highly-trained chemists engaged in this industry in Germany. This country could not compete unless for some period after the war was over some safeguards were given to the capital embarked in the industry.

Mr. W. PEARCE said that, provided it was accompanied by proper scientific, commercial, and business management, the Government scheme would be of real service and make a beginning in bringing back a large part of the enormous chemical industry to this country.

Mr. RUNCIMAN (President of the Board of Trade) said that the annual expenditure on dyestuffs in this country was between 2½ and 2⅙ millions, of which £1,750,000 worth came from Germany, a small amount from Switzerland, and the remainder was made mainly in this country. We were rapidly approaching the danger point as regards the replenishing of our dye supplies. Switzerland could only send her finished products here provided we sent to them the raw material for those products. If the Government bought up the raw products here and sent them to Switzerland, to be returned later as dyestuffs, there was no system of distribution that would not lay the Government open to the charge of making unfair selections and of conferring benefits on individual firms. In these circumstances the Government had come to the conclusion that the only practicable method was that English dye users should purchase the raw products and send them to Switzerland, and that a company representative of those users should be responsible for the distribution of the finished products on the fairest and most equitable terms, and should make arrangements for their sale on the co-operative principle. Some held the view that it would be better that such a company should be brought to an end, and that the organisation should disappear immediately the war was over. The question was examined by a committee of experts, and they came to the unanimous conclusion that this would be throwing away a valuable organisation and would have the effect of again placing the textile and other industries dependent on dyes in a situation in which there would be nothing to enable them to survive the strain of cutting off the supply of dyes. The committee accordingly recommended that the company should continue after the war was over, and that in future, arrangements should be made which could be expanded along lines laid down on the advice of men of technical ability and commercial acumen, for such assistance of the company as would give it some chance of a successful career. They had entered into an arrangement with the Swiss manufacturers for raw products to go out from England, and they had organised the production of some of these raw materials on a wider basis, and they had seen to it that the manufacture of explosives should not altogether exclude the possibility of their having some of the surplus product to send to Switzerland in return for the finished dye. Then they had obtained an option on the works of Messrs. Read, Holliday and Sons, of Huddersfield, which enabled them to take it over at a price which on the average profit of the last six years represented a return of about 6%. There was some chance that the concern, helped and reorganised as it would be, in the future would be able to hold its own, as it had done in the past, in face of German competition. Provisional agreements had been entered into with one or two concerns in England for the purchase of intermediate products. None of the arrangements could go through if they did not link them up together. Indeed, if that were not done they would not deal adequately with the emergency. The small consumer must be safeguarded. He had observed criticisms from Lancashire, Yorkshire, and Scotland, and the most severe had come from the three greatest dyeworks in the United Kingdom. These great concerns could to a large extent take care of themselves, and if the scheme failed they would not regret it nearly as much as the small consumers. The success of the proposed concern must depend largely on the way in which

the German patents were administered. The Emergency Act of last session provided that the operators of German patents in this country should have a full chance of conducting those patents under licence; and it was the intention of the Government not to cripple the company when the war was over, but to give them every opportunity of making the most of those patents. The Government left open for discussion with Germany the payment of royalty in respect of the patents. But the operating of these patents, which would be undertaken by the new company, would proceed after the war was over without interruption and without hindrance. The regulations of the Board of Customs and Excise would enable the company to obtain permission to use alcohol for industrial purposes free from duty by arranging that the denaturing of such alcohol should be carried out under conditions which would not hamper the industry. The same regulation would apply to other concerns that manufactured under the same conditions. The most important criticism related to the agreement which subscribers to the company were asked to sign. The best help that could be given the company was an assured custom for a short period of years, and without that assured custom it naturally followed that the company could not take the bold step without which no prosperity could attach to the reorganisation of the dye industry. As to the objection that the company was not large enough in its scope, it was impossible to range over the whole of the chemical industry, with a small capital. They had made a start, and left the door open for expansion in the future. While there were no chemists on the committee, they had taken the best commercial advice which could be obtained, and they had had at their elbow two at least of the greatest chemists in Europe, one of whom before the war received a retaining fee from one of the largest German combines. The best of our chemists were as good as any that could be found in Europe. The difficulty from which we suffered was that there were not enough second-grade chemists. It was the business of the Government, as in all technical education, to increase the amount of training and instruction for the production of large numbers of such chemists. He did not look upon the grant of £100,000 for the expansion of chemical training, especially in the production of dyes, as being a bonus or subsidy to this concern. It was a grant given for technical education. There was no reason why in the immediate future we should not be able to produce the requisite number of chemists for the dye industry and higher branches of the chemical industry, provided we paid them enough and offered them the prospect of a career. This concern, if it wished to be successful, would have to buy knowledge and skill at a fair price. He asked the committee to accept this scheme as the only one that held the field, and one that was assured of success.

Mr. CHAMBERLAIN said that with the exception of the President of the Board of Trade everybody had regarded the scheme of the Government as not being suitable for the emergency. Mr. Runciman had argued that as it was necessary during the war to form a company it would be a pity to allow it to come to an end immediately after the war. Also that Switzerland could not supply us with what we required unless we supplied her with raw materials, and in order to do this a company must be formed. He himself did not understand why a company was necessary for that purpose. The Government had only to issue to existing individuals licences for the export under conditions which would be laid down, and which the Government could supervise by their agents in Switzerland, and the thing could be done by existing individuals. The Government were quite right to try not only to tide over the immediate months of crisis, but to

relieve the country from a situation which experience had shown to be one of peril. The Government was to form a company to send raw or partially manufactured materials to Switzerland in order to get in return dyestuffs from Switzerland and had issued licences to the company for that purpose. The Government committee had gone far to secure a monopoly in the raw product to be exported to Switzerland for the company. Who was to have the advantage of the goods to come from Switzerland? The company was to distribute them to give (1) a preference to its subscribers, and (2) a preference to those subscribers who bought their dyes from the company for a term of years. For the moment, then, it was clear that there was a very severe coercion. For the immediate emergency during the war, when the necessity was greatest, every pressure that could be applied was put on users of dyes to subscribe to the company. The fact that they were subscribing was no test of their belief in the concern. It was only a test of their urgent need for these dyes. Preference having been given to certain people during the war, these people were to come under an obligation to buy preferentially from the company after the war. They were to buy at a "reasonable price." What security did they give to the company and to the people who were asked to invest money in it? Nobody could exaggerate the magnitude of the German organisation in this trade. The net profit of one German organisation alone was something like £1,000,000 a year. These companies could afford out of their enormous reserves, apart from profits, to trade for a very long time, if they thought it necessary to forego profits, in order to prevent serious competition arising with their industry. The British company had the moment the war was over to face the full force of the competition of this organisation armed with full knowledge and with all the power of experience and skill. The only security which investors believed they had for a return on the money was that under the term "reasonable price" was covered a preference for the products of the British company against the products of the German company. And now the President of the Board of Trade told them that there was no preference, and that if the Germans offered goods cheaper anyone was entitled to buy them. Probably the British company might not be able to supply the British customer with his full demand for any article. What was to prevent the German companies from penalising a man who had to go to them for a part of his supply because the British company could not give him all that he required? He thought that the lines on which the Government was working gave no security for the investor of capital, no security for the user of dyes, and no security for the subscriber, who was both an investor of capital and user of dyes. Protection was not merely given by a tariff, it could be given by a subsidy or by a bounty. Protection could be secured by a monopoly, by a bargain to do trade with one man rather than another, if it could be enforced. This scheme was as protective as anything he had ever proposed or contemplated. He believed that they had to have protection in one form or another in regard to this particular business under these particular circumstances. He did not think the kind of protection which was proposed would be effective. He wanted the money in this case to be used in founding an industry and not thrown away. The Government scheme did not offer the kind of solution on which business men, left to themselves and judging it as a business proposition, would risk their money. He saw no signs of confidence on the part of the men concerned in the future of the business, and he begged the Government to give the question further consideration and see whether they could not find security for a youthful industry,

as desirable after the war as it was urgently needed now, without taking these measures of monopoly, of exclusion, and of preference against particular traders in order to secure support and subscriptions for a scheme launched under Government auspices.

Sir ALFRED MOND said that he did not take such a gloomy view as Mr. Chamberlain, provided they had expert opinion of the right people in the scheme. He did not think the Germans were likely to sell goods at a loss for many years in order to crush out a concern which started to manufacture in this country. He did not see why there should be any secrecy with regard to the identity of the gentlemen who were advising the Government.

Mr. RUNCIMAN: Professor Green is one of them.

Sir A. MOND went on to emphasise the importance of having the best qualified men on the Board who could value the inventions and discoveries which the engineer staff brought to them. The argument that a tariff on German aniline dyes after the war would lead people to subscribe capital was radically unsound, because they did not know the amount of the tariff that would be imposed, nor the price at which the Germans would sell in competition. Moreover, a tariff might lead German manufacturers to establish works here. From the point of view of bringing aniline dyes here that might be a good thing, but it would be a powerful objection to the investment of money in the concern here. He hoped sufficient support would be forthcoming to make the Government scheme a great success.

Mr. J. M. ROBERTSON (Secretary to the Board of Trade) said no working alternative scheme had been presented to the committee. As to the grant for scientific research, if the Government found it necessary to make a frugal grant because of the circumstances and the time, it must not be thought lacking in sympathy with the cause. The grant would be made to the universities with the object of practically promoting this and other chemical industries.

Mr. J. SHARP HIGHAM suggested a new scheme for the establishment of a company under Act of Parliament to deal with drugs and chemicals. This company would discover what could be purchased cheaply, and what it could best make itself. The former it would export and distribute with 10% added for cost of this service and 5% for shareholders' profits. Chemists and experts should be placed by the company at the disposal of the trades concerned.

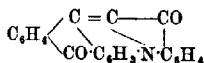
In his Presidential address to the Institute of Chemistry on March 1st, Prof. MELDOLA mentioned the Government scheme for the manufacture of dyestuffs, and emphasised the point that the problem was primarily a chemical and not a business one. About 500 different dyestuffs of definite composition had been provided as the products of chemical research. Of these a certain number only could be made in this country. The Government scheme provided for new and enlarged factories, but unless something more were done there would still be after the war an outstanding number of other products which had never yet been made here, and for the working out of these processes no combination of "business" talent was of the slightest value. It was by chemical research alone that our colour industry could be saved. The German colour industry was built up on the results of 40 years' research. To suppose that we could retrieve our position by starting a company the directorate of which was to consist solely of business people was ludicrous. The Government promise of a grant for 10 years of "not more than £100,000 for experimental and laboratory work" was a welcome concession, but who was to direct that research? The experts

were to be subordinated, and their assistance was to be invoked at the discretion of a Board the members of which could have no real knowledge of the conditions necessary for producing the materials they required. Would they be competent to point out dangers ahead? The "staple products" upon which they were asked to stake their capital might a few years hence be superseded by the products of subsequent discovery. The policy of attempting to run a highly specialized and rapidly developing branch of organic chemical industry by a company of business people, with expert assistance when required, was fatal if it was intended to establish the industry permanently here. The group of industries which had arisen from the products of the tar still was not going to remain stagnant after the war, and it was scientific guidance, and not mere assistance, that would keep them alive. It was the expert, and the expert only, who could foresee the course of development, who could keep in touch with the progress of research, and direct with intelligence the campaign against competitors. If such scientific direction were withheld all schemes were sooner or later bound to end in failure.

PATENTS.

Vat dyestuffs and process of making same. K. Schirmacher and A. Voss, Assignors to Farb. vorm. Meister, Lucius, und Brüning, Höchst on Maine, Germany. U.S. Pat. 1,123,390, Jan. 5, 1915. Date of appl., Feb. 25, 1914.

Vat dyestuffs of the isanthrene series, dyeing cotton various tints of great fastness, are obtained by treating an aromatic glycine with a halogen-anthraquinone, converting the resulting anthraquinonyl- α -arylglycine ester by saponification and dehydration into an anthra-N-arylpyrrolecarboxylic acid, and treating the latter with a dehydrating agent. The simplest isanthrene,



is a reddish-brown powder, sparingly soluble in water and in most organic solvents, readily soluble in pyridine with a reddish brown colour, and in concentrated sulphuric acid with a deep reddish-violet colour, and dyeing cotton red from a hydrosulphite vat.—A. S.

Vat dyes of the dihydro-1.2.2'.1'-anthraquinoneazine (indanthrene) series; Production of— in a finely-divided condition. Farb. vorm. Meister, Lucius, und Brüning. Fr. Pat. 470,984, April 15, 1914. Under Int. Conv., April 15 and 22, and Aug. 25, 1913.

INDANTHRENE dyestuffs are obtained in a state of fine subdivision by treating them with a quantity of sulphuric acid of high concentration (fuming acid, monohydrate, or acid of 66° or 60° B., sp. gr. 1.84 or 1.71) insufficient to dissolve them at the ordinary temperature, and then treating the resulting product with water; or the dyestuff may be intimately mixed with sulphuric acid of 58° B. (sp. gr. 1.67) and the magma treated with water. If the mass be filtered after the treatment with acid, the impurities, especially flavanthrene, are removed in the solution, whilst the indanthrene is left as a residue either of sulphate or partly in the free state, according to the concentration of acid used. By using acid of 60° B. (sp. gr. 1.71), hot or cold, or by heating with acid of sp. gr. 1.67–1.6, the impurities may be removed in this way without any formation of indanthrene sulphate; or acid of high concentration may be used so that the indanthrene is converted completely into sulphate; the mass is then treated

with a limited quantity of water, filtered to remove the dissolved impurities, and the residual indanthrene sulphate decomposed with water. The products obtained give purer and more level shades than the original dyestuffs, and on account of their extreme fineness, in some cases approaching the colloidal condition, are suitable for use as pigments.—A. S.

Ingrain [azo] dyestuff for cotton; Manufacture of an—. Farb. vorm. Meister, Lucius, und Brüning. Ger. Pat. 277,528, Sept. 14, 1912.

3.5.3'.5'.TETRACHLORO-4.4'-DIAMINODIPHENYLUREA is tetrazotised and combined with 2 mols. of *m*-phenylenediaminesulphonic acid. The dyestuff when developed on cotton with diazotised *p*-nitraniline gives an orange shade very fast to washing and readily discharged. It gives a much brighter shade than the corresponding dyestuff from *pp'*-diaminodiphenylureadisulphonic acid and is superior to the dyestuff from *pp'*-diaminodiphenylurea in regard to fastness to bleeding.—A. S.

Disazo cotton dyestuffs fast to light; Manufacture of—. Farb. vorm. Meister, Lucius, und Brüning. Ger. Pat. 277,571, Oct. 26, 1912.

DIAZO-COMPOUNDS from aromatic aminosulphonic acids or their derivatives are combined with *o*-amino-*m*-xylenol alkyl ethers ($\text{CH}_3 \cdot \text{CH}_2 \cdot \text{OR}$; $\text{NH}_2 = 1:3:4:5$), and the mono-azo dyestuffs thus obtained are diazotised and combined with aminonaphtholsulphonic acids or their derivatives. The resulting dyes are faster to light than those described in Fr. Pat. 402,120 (this J., 1909, 1190).—A. S.

Azo dyestuffs containing arsenic; Manufacture of—. Farb. vorm. Meister, Lucius, und Brüning. Ger. Pat. 278,421, July 27, 1913.

3.5-DIAMINOPHENYLARSINIC acids, substituted except in the position 4, or their reduction products, are combined with diazo-compounds. The dyestuffs are valuable therapeutic agents for infectious diseases and have a relatively slight toxic action. By using diazo-compounds containing acid residues, *e.g.* diazotised sulphanilic acid, the process can be used for converting arsenic compounds insoluble in alkalis (*e.g.* hexa-aminoarsenobenzene) into compounds soluble in alkalis.—A. S.

Disazo dyestuffs; Manufacture of black, secondary— soluble in oils, fats, esters, and similar media. Badische Anilin und Soda Fabrik. Ger. Pat. 278,079, April 18, 1913.

AMINOAZO-COMPOUNDS prepared in the usual manner from one mol. of aniline, toluidine, or the like and a second similar molecule or a molecule of *a*-naphthylamine, are diazotised and combined with 1.8-naphthylenediamine or its *N*-alkyl derivatives. The resulting dyestuffs are soluble in fatty, essential, and mineral oils, and in waxes and amyl acetate, and hence can be used in the preparation of printing inks, boot polishes, and lacquers.—A. S.

Vat dyestuffs; Manufacture of—. Kalle und Co. A.-G. Ger. Pat. 277,197, Nov. 20, 1912. Addition to Ger. Pat. 241,997.

INSTEAD of the α -derivatives of isatin specified in the chief patent (this J., 1914, 247), the derivatives (including derivatives substituted in the nucleus, homologues and analogues) of 2.3-diketodihydro-(1)-thionaphthene, substituted in the 2-position, are used. The dyestuffs give a more violet shade than those described previously.—A. S.

Trisazo colouring matter; Blue — A. Blank, C. Heidenreich, and J. Jansen, Leverkusen, Germany, Assignors to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,125,050, Jan. 19, 1915. Date of appl., April 21, 1914.

SEE Fr. Pat. 471,284 of 1914; this J., 1915, 171.

Azo colouring matter. Azo dye. K. Desamari, Cologne, Germany, Assignor to Synthetic Patents Co., Inc., New York. U.S. Pats. 1,125,073 and 1,125,074, Jan. 19, 1915. Date of appl., April 1, 1914.

SEE Eng. Pat. 25,029 of 1913; this J., 1914, 71.

Azo dyestuff. K. Desamari, Cologne, Germany, Assignor to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,126,413, Jan. 26, 1915. Date of appl., April 1, 1914.

SEE Eng. Pat. 22,313 of 1913; this J., 1914, 743.

Azo dyes. R. Kothe and O. Dressel, Elberfeld, Germany, Assignors to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,126,489, Jan. 26, 1915. Date of appl., Jan. 5, 1914.

SEE Ger. Pat. 274,081 of 1913; this J., 1914, 784.

Vat dyes; Yellow to brown — M. H. Isler, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,126,475, Jan. 26, 1915. Date of appl., July 2, 1914.

SEE Eng. Pat. 21,027 of 1913; this J., 1914, 544.

Azo dyes. H. Reindel, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,126,656, Jan. 26, 1915. Date of appl., June 30, 1913.

SEE Fr. Pat. 450,713 of 1913; this J., 1913, 593.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Textiles, etc. Tätigkeitsbericht des Kgl. Materialprüfungsamtes zu Berlin-Lichterfelde für das Jahr, 1913/14. Chem.-Zeit., 1915, 39, 62.

SAMPLES of bleached linen and cotton materials were examined as to weight, strength, and extensibility, both as purchased and after the dressing had been removed. No definite conclusions could be drawn as to the effects of the dressing, except that in general the elongation before rupture was greater after its removal. Artificial horsehair is now not only dyed but also weighted. Cotton tissues and warps which became brittle and tender were found in several cases to have been treated with sizing or finishing preparations containing magnesium chloride, from which hydrochloric acid would be liberated during such operations as ironing, hot calendering, etc. In some cases, the tendering was attributed to the materials having been dyed with sulphide dyestuffs, from which sulphuric acid may be formed under certain conditions. Thiourea used to preserve weighted silk according to Gianoli's process, was found frequently to contain a considerable quantity of thiocyanate. A yellow dyed silk tissue, which had been stored for about a year, and had become brittle and tender in places, was found to have been tolerably heavily weighted and treated by Gianoli's process, but the thiourea, owing to its solubility in water, had been removed from some of the places, and these had consequently deteriorated they could not be used. —A. S.

[Paper-making.] *Retention of stuff.* F. Cyster. Paper Making, 1915, 34, 487—489.

THE most important factor in the retention of stuff on the wire of the paper machine is the condition of beating of the fibres. An example is given of two esparto papers of similar original composition but treated very differently in the beating, one being an "antique" paper beaten quickly and very lightly, the stuff containing 16.2% of mineral matter before running on the wire, and the other a "litho" paper, well beaten to give a close sheet, containing 15.6% of mineral matter before running. An examination of the back-waters showed that the following proportions of the original materials had passed through the wire:—"antique," fibre 6.41%, loading 42.45%; "litho," fibre 3.5%, loading 11.4%. In the case of wood pulp papers beaten quickly, the loss of fibre is greater than with esparto papers, amounting in one case to 10.3%, while a similar pulp well beaten showed a loss of only 3%. The loss of mineral matters is so largely affected by the condition of beating of the fibres that the author considers the question of plasticity in the testing of china clays is comparatively unimportant; the thickness of the sheet and the nature of the sizing are likewise quite subordinate factors. In paper mill economy the re-use of the back-waters is a matter of first importance, particularly in the manufacture of quickly beaten papers. —J. F. B.

PATENTS.

[Silk cotton] *Insulating material; Electric* — applicable as a heat-insulating material. F. Rowley, and Sanrairie Syndicate, Ltd., London. Eng. Pat. 1133, Jan. 15, 1914.

COMPRESSED silk cotton, e.g. kapok, is used as electric or heat insulating material and for waterproofing purposes. Sheets of the compressed material may be provided with a matrix when used for waterproofing purposes in buildings. —B. N.

Cellulose; Process of treating wood and plants to make — B. Loomis, Hartford, Conn., Assignor to Loomis Utilisation Co., East Orange, N.J. U.S. Pat. 1,122,404, Dec. 29, 1914. Date of appl., Mar. 22, 1912.

THE material is treated in a closed vessel first with hot water and then with a dilute alkaline solution, which is circulated at gradually increasing temperatures through the material, a heater, and a separator, in which the matters removed from the material are separated by floating or deposition. The cleansed material is subsequently digested with alkali to reduce it to pulp. —J. F. B.

Paper-stock; Method and apparatus for producing — W. E. Phelps, Baltimore, Md. U.S. Pat. 1,123,000, Dec. 29, 1914. Date of appl., June 20, 1913.

FIBROUS paper-making material is disintegrated by stirring it with water in a tank, and then passing it through a conduit making a circuit back to the tank. The conduit is divided into several sections, each separated from the next by a vacuum pump, the suction produced by each consecutive pump being greater than that produced by the pump in the preceding section. —J. F. B.

Porous and fibrous material; Method of treating — G. D. Burton, Assignor to The Burton Co., Boston, Mass. U.S. Pat. 1,123,166, Dec. 29, 1914. Date of appl., Sept. 24, 1912.

FIBROUS materials, such as corn (maize) stalks, straws, and grasses, are charged into a perforated drum revolving in a receptacle containing a soap solution, which may be mixed with borax, sodium

carbonate, or ammonia. The treatment is continued until the dirt, seeds, and other impurities attacked by these reagents have passed through the perforations of the drum. The cleansed material is then reduced to pulp by revolving the drum in a solution of caustic soda, sp. gr. 1.010—1.015, until the pulp fibres have all passed through the perforations, leaving the undigested weeds, etc., inside the drum.—J. F. B.

Plastic masses; Manufacture of — by the action of aldehydes on albuminous substances [yeast residues]. H. Blücher and E. Krause. Ger. Pat. 275,857, June 3, 1913.

THE residues obtained in the manufacture of yeast extracts are used as raw materials, mixed, if desired, with other albuminous substances and with filling materials.—A. S.

Glue and glycerin from waste paper coated with the same; Process for recovering —. P. Hey. Ger. Pat. 279,141, Nov. 1, 1913.

THE paper is soaked in cold water and then placed on a series of superposed sieves in a closed chamber into which steam is delivered. The mixture of glue and glycerin is liquefied by the steam and flows through the sieves, being collected by intermediate inclined plates which deliver it into a common receptacle, provided with an outlet pipe, at the bottom of the chamber. The chamber is fitted with an overflow pipe for condensed water.—A. S.

Wool-scouring and analogous liquors; Recovery of grease and other ingredients from —. W. G. Abbott, jun., Wilton, N.H., U.S.A. Eng. Pat. 18,736, Aug. 17, 1914.

SEE U.S. Pat. 1,110,277 of 1914; this J., 1914, 1006.

Fertiliser from sulphite-cellulose waste lyes. Ger. Pat. 278,492. See XVI.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

PATENTS.

Textile fabrics; Machines for washing —. B. Nyborg, Norrköping, Sweden. Eng. Pat. 10,879, Apr. 30, 1914.

IN open-width washing machines the liquid from the squeezing rolls is received on a swivelled plate by which it can either be returned to the material before this enters the liquid in the vat, or delivered into a discharge trough. Rinsing liquid is also applied to the material before it reaches the liquid in the vat.—J. F. B.

Washing apparatus used in bleaching. N. McMurray and T. Knowles, Lambeg, Ireland. Eng. Pat. 16,160, July 7, 1914. Addition to Eng. Pat. 17,971, Aug. 7, 1913 (this J., 1914, 916).

THE rollers of the washing machine are provided with end flanges adapted to rotate with them, and secured in such a manner as to make the entire surface of the rollers free from obstructions or projections. Gudgeon bearings are carried in recesses in the ends of the rollers.—B. N.

Dyeing textile materials such as are capable of being packed; Machines for —. K. Callebaut and J. de Blicquy, Brussels. Eng. Pat. 19,062, Aug. 25, 1914. Under Int. Conv., Jan. 23, 1914.

THE walls of a removable cage or receptacle for the material are inclined inwards, so as to form a

single or double truncated cone. An inlet chamber for the dye liquor is provided at the base or between the bases of the cones and the material is held in a horizontal layer above the inlet in the first case, or both above and below it in the second, so that the liquor flows outwards through the layers.—B. N.

[Sulphide] dyestuffs; Application of —. E. Lodge and J. M. Evans, Huddersfield. Eng. Pat. 23,386, Nov. 18, 1914. Addition to Eng. Pat. 29,852, Dec. 29, 1913 (this J., 1915, 135).

THE process is applied to the dyeing of animal fibres, including furs and feathers, and also to artificial silk.—B. N.

Dyeing machine. W. W. Sibson and B. A. Parkes, Assignors to The Philadelphia Drying Machinery Co., Philadelphia, Pa. U.S. Pat. 1,125,747, Jan. 19, 1915. Date of appl., April 15, 1914.

A ROTATING cage is mounted within a tank, which is supported upon a frame, so that it can be oscillated or held in various adjusted positions, without disturbing the operation of the cage. A discharge pipe, connected to the lower end of the tank, is arranged so that it may be uncoupled, whereby the tank may be swung on its support. Means are provided for heating the dye liquor in the tank, and the latter is also provided with a counterbalanced cover.—B. N.

Multicolour effects in threads or fabrics. A. Heinzel, jun. Ger. Pat. 277,497, June 3, 1913.

ARTIFICIAL fibres, such as artificial silk, are impregnated with a solution of a cerium-oxygen compound having an oxidising action, the excess of the solution is removed by hydro-extracting or pressing, and the fibres, without further drying, are placed in a bath containing 10—20 c.c. of soda lye of 40° B. (sp. gr. 1.383) per litre. The treated fibres are spun or woven with untreated artificial fibres or with vegetable fibres, untreated or treated in a similar manner, then dyed, and treated with an agent capable of liberating oxygen from the cerium compound. A gelatin solution or the like may be applied as a finish to the artificial fibres after the treatment.—A. S.

Dyeing and like treatment of textile material; Apparatus for —. J. T., and E. Brandwood, Bury. U.S. Pat. 1,125,803, Jan. 19, 1915. Date of appl., Feb. 12, 1913.

SEE Eng. Pat. 436 of 1913; this J., 1914, 133.

Printing-pastes and process of producing same. J. Carstens, Leverkusen, Assignor to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,126,387, Jan. 26, 1915. Date of appl., Nov. 20, 1912.

SEE Eng. Pat. 22,201 of 1912; this J., 1913, 531.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Acids and bases; Determination of very weak — by means of electrolytic conductivity measurements. S. Horiba. Mem. Coll. Sci., Imp. Univ., Kyoto, 1914, 1, 35—47.

FROM data obtained by measuring, at 25° C., the conductivities of (1) a mixture of aniline (weak base) with an excess of hydrochloric acid, and (2) a mixture of phenol (weak acid) with an excess of sodium hydroxide, the following empirical formulæ were deduced and found satisfactory as a basis for the determination of weak bases and acids, respectively, under similar conditions:—

(1). $0.2985 C = x_a - x$, where C is the concentration of the weak base (aniline), x and x_a the specific conductivities of the mixture and acid, respectively, the concentration of the latter being between $N/50$ and

$N/25$. (2). $C_a = -\frac{x_m - x_b}{0.154 + 0.0433 \times C_b}$, where C_a

and C_b are the concentrations of the weak acid (phenol) and sodium hydroxide, respectively, x_m and x_b the specific conductivities of the mixture and the sodium hydroxide respectively, C_b being between $N/25$ and $N/50$, and C_a less than half C_b . The constants of the hydrolytic dissociation of aniline hydrochloride and sodium phenoxide were also calculated.—W. E. F. P.

Formic and acetic acids; Determination of — and the separation of these acids in very dilute solutions. E. Heuser. Chem.-Zeit., 1915, 39, 57—59.

THE determination of formic and acetic acids by acidifying with sulphuric acid and distilling with steam requires too much time for ordinary use, and if the sulphuric acid be replaced by phosphoric acid, the results are vitiated by the latter passing over into the distillate. Good results are obtained if the vapours are passed through a flask filled with glass beads and heated by a water-bath, on their way to the condenser (cf. Wenzel, Monats. Chem., 1897, 659). The sample is mixed with 50 c.c. of water and 50 c.c. of phosphoric acid of sp. gr. 1.2 and distilled at 44° C. (56 mm. pressure) until the volume is reduced to 50 c.c. A further 50 c.c. of water is then added and the mixture again distilled to a volume of 50 c.c. A current of air free from carbon dioxide is drawn through the apparatus during distillation. The use of a flask filled with glass beads is also necessary in determining acetic acid by distillation in a mixture of formic and acetic acids after destroying the former by oxidation with bichromate and sulphuric acid (see Macnair, Z. anal. Chem., 1888, 27, 398).—A. S.

Alkali bicarbonates; Dissociation pressures of the —. II. Potassium, rubidium, and caesium hydrogen carbonates. R. M. Caven and H. J. S. Sand. Chem. Soc. Trans., 1914, 105, 2752—2761. (See this J., 1911, 800.)

THE dissociation pressures of the bicarbonates of potassium, rubidium (above 158° C.), and caesium (above 165° C.) can be represented by the equation $\log p = a - b/T$ where $a = 10.832, 12.712$, and 16.930 , and $b = 3420, 4300$, and 6300 , for K, Rb, and Cs respectively, and the heats of dissociation, per 2 gm.-mols., calculated from these values were 31,460, 39,560, and 59,960 calories. Anomalous pressure values with rubidium and caesium bicarbonates, below the temperatures stated, were probably due to impurity. The results show an increase of stability with rise of atomic weight of the alkali metal, the temperatures of sensible dissociation of potassium, rubidium, and caesium bicarbonates being considerably higher than that of the sodium salt. By determining the molecular ratio $H_2O : CO_2$ in the gaseous phase, it was proved that the dissociation products of the alkali bicarbonates are normal carbonate, carbon dioxide, and water, no hydrated intermediate compounds being formed.—F. SODN.

Stassfurt deposits; Quantitative chemical composition of the —. M. Rozsa. Z. anorg. Chem., 1915, 90, 377—385.

DISCUSSING the origin of the Stassfurt deposits, the author is unable to reconcile either the disproportionate amount of anhydrite in comparison with rock-salt or the regularity and purity of the layers in the anhydritic rock-salt with Ochsenius' hypothesis of a continuous influx of sea-water and the removal of the final mother-liquors to the

outside ocean. On the contrary, in the early stages of evaporation of the Zechstein lake the process of deposition of gypsum and rock-salt has been interrupted or even reversed, owing apparently to the sporadic influx of other mother-liquors of varying composition. The comparative thinness of the rock-salt layer also denotes the removal of a considerable portion of the mother-liquors from the Zechstein lake rather than the continuous influx of sea-water. Such processes are explained on the basis of local saturation and deposition effected through segregation of partially evaporated sea-water in depressions, followed either by tectonic changes in the lake-bed resulting in the distribution of the mother-liquor over a large area, or, less frequently, by a fresh influx from the sea. The existence of numerous salt deposits in the area between the Russian and Dutch frontiers of Germany, the North Sea and the heights of central Germany is ascribed to this cause. The formation of annual anhydritic layers and the periodic variations in the proportion of calcium sulphate to sodium chloride, are attributed to changing climatic conditions: the effect of temperature and rainfall on depositions from such solutions is discussed at length. The arguments are supported by the results of a series of quantitative analyses.—J. R.

Potash industry; The waste liquors of the —. Berge. Z. angew. Chem., 1914, 27, 660—662.

IN a refinery treating daily 400 tons of crude carnallite salts, containing about 16% KCl, there is produced 200 cb. m. of waste liquors of sp. gr. 1.30, containing about 30% $MgCl_2$. A promising process for the utilisation of these liquors is that suggested by K. Hepke (Ger. Pat. 278,108; following). Of the 200 cb. m. of waste liquors, 90 cb. m., containing 30 tons of $MgCl_2$, would be decomposed, assuming a yield of 75%, to produce 16 tons of crude 80% magnesia and 58 tons of hydrochloric acid of 30% strength. The remaining 110 cb. m. of liquor, containing 43 tons of $MgCl_2$, could be incorporated with the 16 tons of magnesia to produce about 140 tons of magnesium oxychloride.—J. F. B.

Potash supplies in the United States. Oil, Paint, and Drug Rep., Feb. 8, 1915.

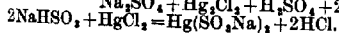
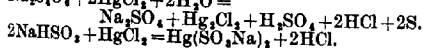
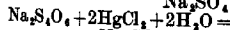
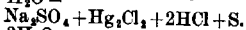
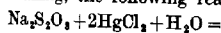
IT is stated officially that the reasons for the placing of an embargo by Germany on exports of potash to the United States, are that part at least of the potash is used in the production of explosives, which might ultimately be sold to countries at war with Germany. Further, potash is exported in jute bags, and the jute is now required by the German Government for other purposes. It is suggested that American importers should give the necessary guarantees that the potash would not be used to make explosives, and that heavy cotton bags should be sent to Germany to carry the potash. In the meantime, much attention is being given to the American sources of potash. As regards the Searles Lake deposits in California, it is stated that over £300,000 has been spent in development, but that a considerable addition to the plant will have to be made if potash is to be produced in commercial quantities. The Bureau of Soils considers that the expenditure of about £10,000 in manufacturing equipment for the Pacific Coast kelp fields will be sufficient to instal plant for producing potash on a small commercial scale. It is further stated that about 15,000 tons of potash might be obtained from the waste of the beet sugar industry in the United States, and a further 5000 tons from the scouring of raw wool. In a report to the U.S. Geological Survey, Mr. H. S. Gale expresses the opinion that the kelp beds afford the only really promising fields for acquiring potash in commercial quantities.

Magnesium chloride solutions; The solidification of concentrated—H. Hof. Chem.-Zeit., 1915, 39, 15.

IN the process described previously (this J., 1914, 863) for solidifying the residual liquors of the German potash industry containing magnesium chloride, by the addition of calcined kieserite, the solidification is caused by the separation of magnesium chloride due to removal of water by the hydration of the magnesium sulphate, which however only proceeds to the tetrahydrate. In a similar manner mother liquors containing potassium salts may be solidified by addition of calcined "Hartsalz" rich in potassium chloride and in kieserite, or of "Hartsalz" rich in potassium chloride together with a sufficient quantity of calcined kieserite, whereby a product similar to kainit is obtained.—W. H. H. N.

Sulphites, thiosulphates, and polythionates; Method of determining—A. Sander. Z. angew. Chem., 1915, 28, 9—12.

POLYTHIONATES, thiosulphates, and sulphurous acid may be determined in presence of each other by titrating the thiosulphate and sulphurous acid with $N/10$ iodine solution (a c.c.), the polythionate being unacted upon, and determining the sulphuric acid formed by the oxidation of the sulphurous acid by titration with $N/10$ caustic soda (b c.c.). Then $b/2$ c.c. is the measure of the iodine reacting with the sulphurous acid and (a-b/2) that reacting with the thiosulphate. In a fresh portion of the original solution the sulphurous acid is converted into bisulphite by means of $N/10$ NaOH in the presence of methyl orange, and the neutralised solution is poured into an excess of a cold saturated solution of mercuric chloride: in 45 minutes, with frequent shaking, the following reactions are complete:—



The acidity is titrated with $N/10$ NaOH, as above, and that due to the known amount of thiosulphate and bisulphite computed. The remainder is due to polythionates, and is expressed in terms of grm.-mols. of NaOH; one-fourth of this result represents the grm.-mols. of polythionates present.—W. H. H. N.

Polysulphides of potassium. Polysulphides of the alkali metals. II. A. Rule and J. S. Thomas. Chem. Soc. Trans., 1914, 105, 2819—2829. (See this J., 1914, 198.)

AN examination of the solids formed by adding sulphur, in varying proportion, to an alcoholic solution of potassium hydrosulphide, and a determination of the amount of hydrogen sulphide evolved during the reaction, showed the chief product to be potassium pentasulphide, which separated in extremely hygroscopic orange-red crystals; no evidence of the formation of higher polysulphides was obtained. The pentasulphide darkened on heating, but melted without decomposition at about $220^\circ\text{C}.$; it readily oxidised on exposure to air, with the liberation of sulphur. Metallic potassium reduced an alcoholic solution of potassium pentasulphide to lower polysulphides, but no definite product was isolated.—F. SODN.

Calcium nitrate factories; Toxic symptoms among workers in—F. Koelsch. Münch. Med. Woch., 1914, 1889. Pharm. J., 1915, 94, 241.

WORKERS in factories where calcium nitrate is produced electrically from the atmosphere, are subject to a peculiar form of industrial poisoning,

which is attributed to calcium cyanide in the dust inhaled. The symptoms do not develop until some alcoholic beverage is taken; then the head becomes hot and flushed while the limbs feel cold. Pulsation is felt in the chest and neck, while respiration becomes difficult. Even minute quantities of alcohol may produce these symptoms. The face and neck then become cyanosed while the trunk and arms acquire a bright red-coloured rash, unaccompanied by any great rise in temperature. The reflexes remain normal, and the senses are unimpaired. In severe cases giddiness and jactitation occur. The duration of the attack is variable, according to the amount of alcohol taken. When vomiting or diarrhoea occurs, instant improvement follows, and the rash immediately fades. No permanent ill-effects have been observed hitherto. No case of acquired immunity has been recorded. A few hours' stay in the dusty factory is sufficient to render a workman liable to attack. Total abstainers are not affected; after an absence of a day or two from the works alcohol may be taken with impunity. The attacks do not occur in workmen who have taken alcohol previous to going to work.

Calcium carbide manufacture. Times, Eng. Suppl., Jan. 29, 1915.

UNTIL the outbreak of the war the situation of the calcium carbide industry was satisfactory. While the demand for lighting purposes showed a steady increase, that for oxy-acetylene welding continued to increase with great rapidity, but on the other hand the requirements of carbide for making fertilisers, such as cyanamide, do not appear to have made much progress. By far the largest consumer for this last purpose was Germany, and it is reported that the chief German contractors, even before the war, failed to take the increased quantities which they had led the manufacturers to believe they could place. The outbreak of the war seriously interfered with manufacture. The factories in Norway were compelled to shut down, with one exception, chiefly owing to the difficulty of shipping raw material. A British-run factory, that of the Albion Products Co., continued to run its factory at full power, and even succeeded in somewhat increasing its production. In other parts of Europe mobilization caused either complete or partial shutting-down of the factories. The important factories in Austria, on the Dalmatian coast, have no means of transport except by sea. The result has been that a shortage is beginning to be felt in certain sizes of carbide, particularly those required for motor and cycle lamps, which these factories especially catered for. The war also caused a serious decrease in the manufacture of cyanamide, owing to the German market being made more or less inaccessible. The war has made a very considerable difference in the consumption of calcium carbide. The consumption for lighting purposes has decreased considerably, but the consumption for oxy-acetylene welding purposes and for emergency lighting has increased enormously. The British War Office decided to equip the motor-omnibuses and motor-cars sent to France with acetylene lighting, and is shipping large quantities of carbide to France. The only factory producing carbide in this country, that at Thornhill, Yorkshire, reports a very successful year. The war put an end to the Syndicate of Continental Carbide Factories, as it proved impossible to continue the co-operation between British, French, Austrian, and German manufacturers. British, French, and Swiss manufacturers each held a larger interest in the syndicate than the German manufacturers. At the present time a decided shortage of carbide is beginning to make itself felt in many countries, although in Great Britain prices are about at the same level as before

the war. It is, however, generally anticipated that they will be put up shortly, because not only is the cost of manufacturing increasing very rapidly, but the freights for carbide from the Continent to this country are already about 50% higher than before the war.

Stannous and potassium chlorides; The double salts of — T. Fujimura. Mem. Coll. Sci., Imp. Univ., Kyoto, 1914, 1, 63—68.

ONLY two double salts, $\text{SnCl}_2 \cdot \text{KCl} \cdot \text{H}_2\text{O}$ and $\text{SnCl}_2 \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O}$, were found to exist at 25° C., thus confirming the conclusion of Remsen and Richardson (Amer. Chem. J., 1892, 14, 89).

—W. E. F. P.

Lead oxide, acetic acid, water; The system — S. Sakabe. Mem. Coll. Sci., Imp. Univ., Kyoto, 1914, 1, 57—61.

THE only basic salts found to exist in contact with solutions, at 25° C., were $\text{Pb}(\text{OH})(\text{C}_2\text{H}_3\text{O}_2)$ and $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{Pb}(\text{OH})$, thus confirming the conclusion of Löwe (J. prakt. Chem., 1866, 98, 385); no acid salt was formed under these conditions. (See also Jackson, this J., 1914, 1046.)

—W. E. F. P.

Peroxides of the alkaline-earth metals. E. H. Riesenfeld and W. Nottebohm. Z. anorg. Chem., 1915, 90, 371—376. (See also this J., 1915, 78.)

THE decomposition of anhydrous calcium peroxide at atmospheric pressure, although commencing at about 220° C., occurred very slowly up to about 273° C. At 273°, 14.6% of active oxygen remained after 21 hours; at 282°, 10.3% after 24 hours; at 298°, 4.2% after 22 hours; and at 308° C., 0.5% after 46 hours. At 255° C. the dissociation pressure was above 190 atmospheres, and it is concluded that the production of calcium peroxide by the action of oxygen on lime would require pressures which are unattainable in practice.—J. R.

Silicon tetrachloride, disilicon hexachloride, and the higher chlorides of silicon; Preparation of—by the action of chlorine on 50% ferrosilicon, together with a discussion on their mode of formation. Silicon compounds; Researches on — VI. G. Martin. Chem. Soc. Trans., 1914, 105, 2836—2880.

SILICON tetrachloride and disilicon hexachloride were prepared by passing chlorine over commercial 50% ferrosilicon heated to 180°—200° C. in an iron tube; about 3 kilos. of the hexachloride and 200 grms. of trisilicon octachloride, besides smaller quantities of mixed higher chlorides, were obtained by fractionating, under anhydrous conditions, 54 kilos. of the crude tetrachloride first collected. The apparatus employed and mode of operating are fully described: an essential condition is the exclusion of atmospheric moisture. Silicon tetrachloride had no appreciable action on silicon at 200°—340° C. (compare Gattermann and Weinlig, Ber., 1894, 27, 1943), and disilicon hexachloride, although readily dissolving chlorine, was not affected by it at the ordinary temperature. The hexachloride, however, took fire in chlorine at about 300° C., forming silicon tetrachloride, and the tetrachloride is regarded therefore as the final product of the action of chlorine on ferrosilicon, resulting from the chlorination of more complex chlorides; this accounts also for the fact that no silicon tetrachloride was collected during the first half-hour of operating. All the products reacted with water to form white amorphous compounds which were readily combustible and dissolved in potassium hydroxide with the evolution of hydrogen.—F. SODN.

Disilicon hexachloride; Action of ethyl alcohol on — Researches on silicon compounds. VII. G. Martin. Chem. Soc. Trans., 1914, 105, 2860—2872.

ALCOHOL reacts vigorously with disilicon hexachloride, producing intense cold and giving a mixture of ethoxy-derivatives. The compounds $\text{Si}_2\text{Cl}_6 \cdot \text{OC}_2\text{H}_5$, $\text{Si}_2\text{Cl}_6 \cdot (\text{OC}_2\text{H}_5)_2$, $\text{Si}_2\text{Cl}_6 \cdot (\text{OC}_2\text{H}_5)_3$, $\text{Si}_2\text{Cl}_6 \cdot (\text{OC}_2\text{H}_5)_4$, and $\text{Si}_2(\text{OC}_2\text{H}_5)_6$, were prepared as colourless oils, boiling at 84°, 104°, 122°, 138°, and 141° C. respectively, under 34 mm., by treating the hexachloride or a relatively lower ethoxy-derivative with alcohol; the tetra- and penta-ethoxy-derivatives reacted only on heating. The chloro-ethoxy-derivatives attacked the skin and were decomposed by moisture giving white amorphous explosive hydroxy-compounds, whilst the hexa-ethoxy-compound reacted with alkali with the evolution of hydrogen.—F. SODN.

Actinium and ionium; Recovery of— from the Olary ores. S. Radcliff. Chem. News, 1915, 111, 59—60. (See also this J., 1914, 229.)

ACTINIUM. Almost the whole of this constituent appears to be precipitated with the mixed crude sulphates (this J., 1914, 231, table III.) obtained in the course of extracting the radium. The mixture, containing about 3% of rare earths in addition to the constituents enumerated (*loc. cit.*), is fused in an iron crucible with excess of sodium hydroxide containing some sodium carbonate, the melt extracted repeatedly with hot water, the insoluble residue digested with excess of sodium carbonate under a steam pressure of 90 lb., the carbonate residue washed, treated with dilute hydrochloric acid, the solution evaporated to dryness, the residue treated with water, the silica filtered off, and the solution saturated with hydrochloric acid gas (to precipitate the radium and barium) and filtered. The filtrate, containing the actiniferous rare earths, is evaporated to dryness and the residue further treated to separate actinium. IONIUM appears to be chemically inseparable from thorium, so that by extracting and purifying the latter by any of the well-known methods, an active ionium product is obtained. The activity of this product depends on the ratio between the uranium and thorium present in the ore, this ratio being about 100:1 in the case of the Olary ore.—W. E. F. P.

Determination of potassium hydrogen tartrate and tartaric acid. Astruc. See XVIII.

PATENTS.

Sulphuric acid; Apparatus for use in the manufacture of — R. Bithell and J. A. Beck, Belfast. Eng. Pat. 28,743, Dec. 12, 1913.

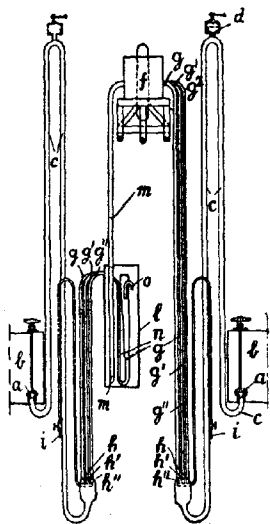
A COLUMN is built up of a number of superposed compartments, each having an opening in the base, fitted with an open pipe, the upper end of which is covered by a hood resting upon the floor of the compartment and perforated near its lower edge. Each hood is provided with a perforated annular flange or shelf, extending to the wall of the compartment, and overflow pipes, piercing the flange connect the compartment with those immediately and below. The apparatus is intended primarily to replace the usual Glover tower, hot burner gases passing upwards through successive layers of dilute acid supplied from above; the current of gas is deflected by the hoods and further broken up by the perforated shelves. An extended column or set of columns may be employed also instead of chambers and Gay Lussac tower.—F. SODN.

Acid from acid sulphates; Recovery of — G. Hunnybun, Huntingdon. From F. J. Stanes and G. S. Rogé, Coimbatore, India. Eng. Pat. 29,254, Dec. 18, 1913.

AN intimate mixture of sulphur with twice its weight of sodium bisulphate is roasted in an open pan to the ignition point of sulphur. The heat of combustion of the latter drives off part of the sulphuric acid, and sulphur is added from time to time until most of the bisulphate is converted into sulphate.—O. R.

Raising liquids, especially sulphuric acid; Apparatus for — C. Nagelschmidt. Ger. Pat. 279,074, Oct. 25, 1913.

THE siphon, *c*, and tubes, *g*, *g'*, *g''*, are filled with acid through the cock, *d*, the valve, *a*, is opened, and compressed air is forced in through the valve,



i, issuing through the nozzles, *h*, *h'*, *h''*, into the tubes, *g*, *g'*, *g''*, and producing a flow of acid from the vessel, *b*, into the collecting vessel, *f*. A vessel, *l* (see centre of figure) may be interposed to prevent spurting of acid and ensure more regular working. When the acid flows into this vessel, the air escapes through the tube, *o*, and siphon, *n*, until the acid level reaches *o*, whereupon pressure develops in the upper part of *l*, and forces the acid through the tube, *m*, into the collecting vessel, *f*.—A. S.

Hydrochloric acid; Process and apparatus for making — A. Engelstad, Berlin, N.H. U.S. Pat. 1,121,910, Dec. 22, 1914. Date of appl., Feb. 4, 1914.

CHLORINE, oxygen (or air), and hydrogen are supplied continuously to a combustion chamber, in which combustion of the chlorine with a portion of the hydrogen is maintained by the simultaneous burning of another portion of the hydrogen with the oxygen. The hydrogen chloride and water vapour produced are led away and condensed to furnish aqueous hydrochloric acid, any uncondensed hydrogen chloride being absorbed by water from a separate source. An excess of hydrogen is used and serves to reduce the temperature in the combustion chamber.—F. SODN.

Magnesia and hydrochloric acid; Continuous process for the manufacture of — K. Hepke. Ger. Pat. 278,106, Feb. 27, 1913.

AN infusible mixture of magnesium chloride or magnesium oxychloride with magnesia is passed through a rotary kiln lined with suitable material and heated by direct fire.—A. S.

Hydrochloric acid; Manufacture of — by the action of superheated steam on magnesium chloride. W. Schwarzenauer. Ger. Pat. 279,008, Feb. 20, 1914.

VERTICAL retorts are used, the steam being introduced at the top and hydrochloric acid gas discharged at the bottom.—A. S.

Iodine and other products from seaweed; Means, methods, and appliances for obtaining — J. Hargreaves, Widnes, and G. K. Davis, Manchester. Eng. Pat. 234, Jan. 5, 1914.

SEAWEED is burned completely in vertical brick or iron chambers, each provided with a grid near the bottom, and connected in series by means of pipes; heated air is passed into the top of the first chamber, and the products of combustion are passed downwards through the remaining chambers, each chamber becoming in turn the last, intermediate, and first of the series. The combustible part of the gases from the last chamber is freed from tar and condensable matter, and utilised in any convenient manner. To prevent loss of iodine by volatilisation, a quantity of the ashes obtained in a previous burning is intimately mixed with fresh seaweed, preferably still moist.—O. R.

Kelp and similar aquatic plants; Utilisation of — T. Boberg, N. Testrup, and Techno-Chemical Laboratories, Ltd., London. Eng. Pat. 1766, Jan. 22, 1914.

GIANT kelps, especially *Nereocystis luetkeana*, *Macrocystis pyrifera*, and *Pelagophycus porra*, are minced and pulped, freed from occluded air by reduced pressure, and heated in closed vessels to 170° C. or upwards for 20 minutes, or forced through a continuous heater and heat exchanger, to destroy the water-holding slime constituents. The mass now yields a firm press-cake. The liquor contains about 70% of the original alkali salts, 90% of the iodine, 33% of the nitrogen which totals 1.2% on the dry basis, and 10% of original organic matter. Part of the liquor and washings from the press-cake is used to pulp fresh weed, and the excess is evaporated, and the dried cake incinerated, or burnt with fuel in a producer to recover nitrogen and some heat from its organic content, and the ash extracted for alkali. The press-cake is dried by waste heat, and either carbonised to yield fuel gas and a char valuable for filtering and clarifying, or burnt in a producer, when the nitrogen may be recovered as ammonia and the residual alkali extracted from the ashes.—W. H. H. N.

Salt and like mineral substances; Furnaces for melting — International Salt Co., Ltd., London. A. W. Brown, Belfast, and J. H. Webster, Carrickfergus, Ireland. Eng. Pat. 2988, Feb. 5, 1914.

A MELTING furnace is combined with a refining furnace in the same structure, which surmounts a dual series of longitudinal gas and air regenerators, extending the full length of the two contiguous furnaces and common to both. Vertical, transverse, thin partition walls, spaced apart, extend from a point above the bottom to a point below the roof of the regenerator chambers. The molten salt

flows from the inclined hearth of the melting furnace into the purifying furnace, the hearth of which is divided into a number of shallow baths extending across its full width. The first is comparatively long, and serves for the deposition of solid impurities by gravitation; the next portion comprises comparatively short and shallow baths, in which the molten salt is agitated by means of compressed air or otherwise; the final bath is relatively large and deep, and the overflow for the purified salt is at about the same level as the top of the several baths, so that all the baths in the purifying furnace are kept full.—O. R.

Carbonic acid gas; Absorbent medium for—. J. Cadman, Edgbaston, Warwick. Eng. Pat. 12,454, May 20, 1914.

SMALL lumps of porous material, such as coke or charcoal, are immersed in molten caustic soda or the like, and the latter is agitated so that a film of alkali solidifies over the surface of the lumps. The absorbent being specially intended for use in respirators, calcium chloride is added to it to act as a cooler.—O. R.

Zinc sulphite and oxide; Process for the treatment of zinc solutions for the production of—. P. Ferrère, Paris. Eng. Pat. 13,333, May 30, 1914. Under Int. Conv., April 11, 1914.

A SOLUTION of a zinc salt, especially the sulphate, is saturated with sulphur dioxide in an agitating apparatus, preferably under pressure, and a quantity of alkaline-earth oxide or hydroxide less than half the equivalent of the sulphur dioxide in solution is added. Alkaline-earth sulphate is precipitated, and the solution, which contains zinc sulphite dissolved in excess of sulphurous acid, is treated to recover the zinc sulphite. The latter is calcined, yielding zinc oxide, the sulphur dioxide evolved being used in the first stage of the next cycle of operations.—O. R.

Dry, deflocculated body [graphite, etc.] and method of preparing same. C. P. Townsend, Washington, D.C., Assignor to Acheson Oildag Co., Niagara Falls, N.Y. U.S. Pat. 1,116,957, Nov. 10, 1914. Date of appl., Jan. 18, 1910; renewed March 23, 1914.

GRAPHITE, or other suitable material, is deflocculated by the action of tannin or otherwise, as described in U.S. Pat. 964,478 of 1910 (this J., 1910, 1047), and the stiff paste formed is stirred into sufficient water to suspend the deflocculated material. The suspension is treated with a volatile liquid, such as acetone or ethyl or methyl alcohol, whereby the deflocculated material is precipitated in a "reversible" state, i.e., in a condition in which it may be collected and dried, but from which it passes immediately into a deflocculated suspension when treated with water. Suitable volatile liquids are those which are miscible with water in all proportions, and the precipitate is washed with the concentrated liquid until all water has been eliminated. Lampblack, carbon black, etc., after treatment as described, may be compressed into cakes or sticks to be used for the preparation of printing inks, Indian ink, etc., and the process may be applied to other amorphous pigments.—O. R.

[Radium and other] ions; Process for exchange of—adsorbed by colloids. B. Schwerin, Assignor to Elektro-Osmose A.-G. (Graf Schwerin Ges.), Frankfurt on Maine. U.S. Pat. 1,120,551, Dec. 8, 1914. Date of appl., April 24, 1914.

THE separation of closely related elements, such as the rare earths in general and radium and barium in particular, is effected by adsorbing them together in a suitable colloid, for example manganese dioxide, and de-adsorbing them by treating

it with a suitable electrolyte such as a 1% solution of aluminium chloride. Both processes are selective, and the desired adsorption is obtained by choice of the colloid, and the separation by the choice and concentration of the electrolyte. For the exchange of bases electro-negative colloids are used, and the de-adsorbing solutions found most effective are those of the strongest electro-positive bases. The best separations are obtained when adsorption is effected in the presence of the de-adsorbing solution. In one case the barium-radium adsorption in manganese dioxide was boiled for some minutes with 100 parts of water and 5.35 parts of ammonium chloride. The filtrate then contained 64.7% of the total radium and only 32.7% of the total barium.—W. H. H. N.

Thorium-X; Process for obtaining—. J. Lorenzen. Ger. Pat. 278,121, Sept. 12, 1913.

A COLLOIDAL solution of thorium oxide is dialysed, whereupon thorium-X passes through the membrane, yielding a pure solution. The thorium-X is regenerated continuously from the radiothorium present in ordinary thorium oxide, and further quantities can therefore be separated by renewing the distilled water in the dialyser. The colloidal thorium oxide may be prepared by treating a concentrated solution of thorium nitrate with ammonia, washing the precipitated thorium hydroxide, and digesting it with a small quantity of water after addition of a trace of thorium nitrate.—A. S.

Hydrogen and nitrogen; Process of manufacturing mixed—. G. P. Scholl, New York, Assignor to Westinghouse Lamp Co. U.S. Pat. 1,123,334, Jan. 5, 1915. Date of appl., Oct. 6, 1908.

A MIXTURE of nitrogen and hydrogen in which the ratio N : H is equal to R, is obtained by mixing ammonia gas and air in the proportion of (2R+4) to (3R-1) and passing the mixture over a catalytic agent to induce dissociation of the ammonia and combination of the oxygen with hydrogen. For example, a mixture of equal parts of nitrogen and hydrogen is obtained by charging a closed vessel with ammonia gas under pressure, introducing air until the total pressure is four times the absolute pressure of the ammonia, and then passing the mixture over a catalytic agent.—A. S.

Nitrogen; Process for fixing atmospheric—. S. Peacock, Chicago, Ill., Assignor to International Agricultural Corporation, New York. U.S. Pat. 1,123,584, Jan. 5, 1915. Date of appl., Apr. 19, 1913.

A GASEOUS mixture, obtained by burning sulphur in a limited quantity of air, is passed over heated carbon (800° C.) to form a compound of sulphur, carbon, and nitrogen from which ammonia is subsequently produced by treatment with hot water.—W. E. F. P.

Nitrogen; Process of fixation of atmospheric—by metal carbide. H. W. Lamb, Portsmouth, Va. U.S. Pat. 1,123,763, Jan. 5, 1915. Date of appl., Mar. 18, 1914.

MOLTEN iron carbide, prepared by the action of carbon upon iron oxide, is subjected to the action of nitrogen under pressure so as to form a cyanide.—W. E. F. P.

Nitrogen with oxygen and with hydrogen; Process for obtaining compounds of—. O. Bender. Ger. Pat. 279,007, Oct. 21, 1913.

THE compounds are formed by burning fuels by means of air under pressure, water in a finely divided form being added to the combustion gases or to the air for combustion in quantity equal to

that of the carbon burned. A hollow grate cooled by water, air, etc., is used to cool suddenly the reaction products and thus prevent them from decomposing. With a temperature of about 2000° C. in the interior of the furnace, about 1% NO and 0.25% NH₃ by vol. are stated to be formed.—A. S.

Air; Apparatus for liquefying and separating — J. P. Place, Glen Ridge, N.J., Assignor to American Air-Liquefying Co., New York. U.S. Pat. 1,123,588, Jan. 5, 1915. Date of appl., Feb. 18, 1909.

Air compressed to, or above, its critical point is delivered in part through a throttled nozzle valve, to a rotary engine or air-expanding turbine, and in part to a constant-pressure liquefier, the cold expanded air and gases from the turbine and the liquefier, respectively, being utilised to cool the incoming compressed air.—W. E. F. P.

Oxygen; Process for producing — P. Danckwardt, near Dardanelle, Ark. U.S. Pat. 1,124,304, Jan. 12, 1915. Date of appl., March 4, 1914.

HEATED air is passed into a mass of alkali manganate or a mixture of alkali hydroxide or carbonate and manganese oxide, together with a diluent which has also a fluxing effect. The fused mass circulates to another part of the apparatus where oxygen is liberated by treating it with superheated steam.—W. H. H. N.

Alkali silico-aluminate; Method of making — A. H. Cowles, Assignor to Electric Smelting and Aluminum Co., Sewaren, N.J., U.S. Pat. 1,123,693, Jan. 5, 1915. Date of appl., Dec. 24, 1912.

FINELY-DIVIDED clay or/and felspar is treated with water and sodium chloride vapours while at a high temperature and in contact with furnace gases.—W. E. F. P.

Alkali-metal compounds [potassium chloride]; Process of obtaining — [from felspar]. H. E. Brown, Kingston, N.Y. U.S. Pat. 1,123,841, Jan. 5, 1915. Date of appl., Apr. 30, 1914.

FELSpar is mixed with sufficient calcium chloride and carbonate to convert all the potassium into chloride and produce a residue containing 40–55% of CaO, and is fused at about 1300° C. in an oxidising atmosphere and the volatilised alkali chloride condensed.—W. E. F. P.

Potassium compounds; Process of extracting — from flue dust. S. Peacock, Philadelphia, Pa., Assignor to International Agricultural Corporation, New York. U.S. Pat. 1,124,798, Jan. 12, 1915. Date of appl., April 18, 1914.

FLUE dust is treated with a solution containing mono-calcium phosphate to convert potassium silicates into potassium phosphates, an acid being also added to react with any potassium salts held mechanically by the silicates.—W. H. H. N.

Potassium and aluminium; Process for producing soluble salts of — M. F. Coolbaugh and E. H. Quinney, Rapid City, S.D. U.S. Pat. 1,125,007, Jan. 12, 1915. Date of appl., June 2, 1913.

FINELY powdered potash rock is mixed with a regulated quantity of limestone to fix the silica, and heated to incipient fusion. The mass is quickly cooled and leached with dilute sulphuric acid, and the potassium and aluminium recovered by crystallisation. For each part of silica, 1.7 parts of limestone are used, and sulphuric acid to the

extent of 1.2 times the potash and 3 times the alumina content.—W. H. H. N.

Potassium salts; Continuous process for dissolving — H. Daus. Ger. Pat. 278,869, July 25, 1913.

THE salts are supplied to an inclined sieve so arranged that only the coarser particles are fed into the dissolving vessel near the outlet for the solution, the finer material being introduced at a point some distance away, so that it has time to dissolve before reaching the outlet and hence is not carried away mechanically in the form of slime.—A. S.

Arsenic acid and arsenical compounds; Method of making — G. P. Fuller, Assignor to National Electrolytic Co., Niagara Falls, N.Y. U.S. Pat. 1,125,086, Jan. 19, 1915. Date of appl., June 1, 1914.

ARSENIOUS oxide suspended in brine is electrolysed, the solution is filtered, and then neutralised to produce an arsenate.—W. H. H. N.

Ammonium sulphate; Manufacture of — from distillation gases. E. Chur. Ger. Pat. 277,379, Nov. 19, 1912.

THE gases are freed from tar as usual and then, before passing to the saturator, are warmed and enriched in ammonia by treatment with warm, concentrated ammoniacal liquor. The latter is obtained by passing the ordinary ammoniacal liquor first through a boiler provided with a reflux condenser and then through a column still, the ammoniacal vapours from the still being returned to the boiler through a pipe terminating in a rose below the level of liquor in the boiler. The vapours from the boiler pass into the receptacle for the concentrated ammoniacal liquor, which is provided with means for ensuring intimate contact between the liquor and the distillation gases passing through.—A. S.

Saturator for the production of ammonium sulphate from distillation gases. Berlin-Anhaltische Maschinenbau A.-G. Ger. Pat. 279,134, Jan. 16, 1914.

THE gases are introduced through one or more long hoods, dipping in the liquid and extending across the width of the saturator. Between the hoods, and at right angles to them, are partitions, which divide the upper part of the bath of liquid into zones and also separate the hopper-shaped wells in the bottom of the saturator from one another. By this subdivision of the space within the saturator the effects of variations in the pressure of the gases are minimised.—A. S.

Hydrogen; Apparatus for the manufacture of — F. Bergius, and Chem. Fabr. A.-G. vorm. Moritz Milch und Co. Ger. Pat. 277,501, Nov. 30, 1913. Addition to Ger. Pat. 254,593 (this J., 1913, 195; see also Fr. Pat. 447,080 of 1912; this J., 1913, 364).

AN apparatus for the production of hydrogen by the action of metals on liquid water under pressure, consists of a pressure vessel within which is a central heating tube and around the latter a series of reaction tubes, each of which can be brought in turn below a feed opening in the cover of the pressure vessel.—A. S.

Hydrosulphites; Process for the electrolytic preparation of — Badische Anilin und Soda-Fabrik. Ger. Pat. 278,588, July 7, 1912.

THE process described in Ger. Pat. 276,050 (this J., 1914, 920) is made continuous by circulating the bisulphite solution from a reservoir, through the electrolysing vessels and back to the reservoir.

flows from the inclined hearth of the melting furnace into the purifying furnace, the hearth of which is divided into a number of shallow baths extending across its full width. The first is comparatively long, and serves for the deposition of solid impurities by gravitation; the next portion comprises comparatively short and shallow baths, in which the molten salt is agitated by means of compressed air or otherwise; the final bath is relatively large and deep, and the overflow for the purified salt is at about the same level as the top of the several baths, so that all the baths in the purifying furnace are kept full.—O. R.

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Dry, deflocculated body [graphite, etc.] and method of preparing same. C. P. Townsend, Washington, D.C., Assignor to Acheson Oildag Co., Niagara Falls, N.Y. U.S. Pat. 1,116,957, Nov. 10, 1914. Date of appl., Jan. 18, 1910; renewed March 23, 1914.

GRAPHITE, or other suitable material, is deflocculated by the action of tannin or otherwise, as described in U.S. Pat. 964,478 of 1910 (this J., 1910, 1047), and the stiff paste formed is stirred into sufficient water to suspend the deflocculated material. The suspension is treated with a volatile liquid, such as acetone or ethyl or methyl alcohol, whereby the deflocculated material is precipitated in a "reversible" state, i.e., in a condition in which it may be collected and dried, but from which it passes immediately into a deflocculated suspension when treated with water. Suitable volatile liquids are those which are miscible with water in all proportions, and the precipitate is washed with the concentrated liquid until all water has been eliminated. Lampblack, carbon black, etc., after treatment as described, may be compressed into cakes or sticks to be used for the preparation of printing inks, Indian ink, etc., and the process may be applied to other amorphous pigments.—O. R.

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Hydrogen and nitrogen; Process of manufacturing mixed—. G. P. Scholl, New York, Assignor to Westinghouse Lamp Co. U.S. Pat. 1,123,394, Jan. 5, 1915. Date of appl., Oct. 6, 1908.

A MIXTURE of nitrogen and hydrogen in which the ratio N : H is equal to R, is obtained by mixing ammonia gas and air in the proportion of (2R+4) to (3R-1) and passing the mixture over a catalytic agent to induce dissociation of the ammonia and combination of the oxygen with hydrogen. For example, a mixture of equal parts of nitrogen and hydrogen is obtained by charging a closed vessel with ammonia gas under pressure, introducing air until the total pressure is four times the absolute pressure of the ammonia, and then passing the mixture over a catalytic agent.—A. S.

Nitrogen; Process for fixing atmospheric—. S. Peacock, Chicago, Ill., Assignor to International Agricultural Corporation, New York. U.S. Pat. 1,123,584, Jan. 5, 1915. Date of appl., Apr. 19, 1913.

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Nitrogen; Process of fixation of atmospheric—by metal carbide. H. W. Lamb, Portsmouth, Va. U.S. Pat. 1,123,763, Jan. 5, 1915. Date of appl., Mar. 18, 1914.

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THE compounds are formed by burning fuels by means of air under pressure, water in a finely divided form being added to the combustion gases or to the air for combustion in quantity equal to

that of the carbon burned. A hollow grate cooled by water, air, etc., is used to cool suddenly the reaction products and thus prevent them from decomposing. With a temperature of about 2000° C. in the interior of the furnace, about 1% NO and 0.25% NH₃ by vol. are stated to be formed.—A. S.

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AIR compressed to, or above, its critical point is delivered in part through a throttled nozzle valve, to a rotary engine or air-expanding turbine, and in part to a constant-pressure liquefier, the cold expanded air and gases from the turbine and the liquefier, respectively, being utilised to cool the incoming compressed air.—W. E. F. P.

Oxygen; Process for producing — P. Danckwardt, near Dardanelle, Ark. U.S. Pat. 1,124,304, Jan. 12, 1915. Date of appl., March 4, 1914.

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Alkali silico-aluminate; Method of making — A. H. Cowles, Assignor to Electric Smelting and Aluminium Co., Sewaren, N.J., U.S. Pat. 1,123,693, Jan. 5, 1915. Date of appl., Dec. 24, 1912.

FINELY-DIVIDED clay or/and felspar is treated with water and sodium chloride vapours while at a high temperature and in contact with furnace gases.—W. E. F. P.

Alkali-metal compounds [potassium chloride]; Process of obtaining — [from felspar]. H. E. Brown, Kingston, N.Y. U.S. Pat. 1,123,841, Jan. 5, 1915. Date of appl., Apr. 30, 1914.

FELSPAR is mixed with sufficient calcium chloride and carbonate to convert all the potassium into chloride and produce a residue containing 40–55% of CaO, and is fused at about 1300° C. in an oxidising atmosphere and the volatilised alkali chloride condensed.—W. E. F. P.

Potassium compounds; Process of extracting — from flue dust. S. Peacock, Philadelphia, Pa., Assignor to International Agricultural Corporation, New York. U.S. Pat. 1,124,798, Jan. 12, 1915. Date of appl., April 18, 1914.

FLUE dust is treated with a solution containing mono-calcium phosphate to convert potassium silicates into potassium phosphates, an acid being also added to react with any potassium salts held mechanically by the silicates.—W. H. H. N.

Potassium and aluminium; Process for producing soluble salts of — M. F. Coolbaugh and E. H. Quinney, Rapid City, S.D. U.S. Pat. 1,125,007, Jan. 12, 1915. Date of appl., June 2, 1913.

FINELY powdered potash rock is mixed with a regulated quantity of limestone to fix the silica, and heated to incipient fusion. The mass is quickly cooled and leached with dilute sulphuric acid, and the potassium and aluminium recovered by crystallisation. For each part of silica, 1.7 parts of limestone are used, and sulphuric acid to the

extent of 1.2 times the potash and 3 times the alumina content.—W. H. H. N.

Potassium salts; Continuous process for dissolving — H. Daus. Ger. Pat. 278,869, July 25, 1913.

THE salts are supplied to an inclined sieve so arranged that only the coarser particles are fed into the dissolving vessel near the outlet for the solution, the finer material being introduced at a point some distance away, so that it has time to dissolve before reaching the outlet and hence is not carried away mechanically in the form of slime.—A. S.

Arsenic acid and arsenical compounds; Method of making — G. P. Fuller, Assignor to National Electrolytic Co., Niagara Falls, N.Y. U.S. Pat. 1,125,086, Jan. 19, 1915. Date of appl., June 1, 1914.

ARSENIOUS oxide suspended in brine is electrolysed, the solution is filtered, and then neutralised to produce an arsenate.—W. H. H. N.

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THE gases are freed from tar as usual and then, before passing to the saturator, are warmed and enriched in ammonia by treatment with warm, concentrated ammoniacal liquor. The latter is obtained by passing the ordinary ammoniacal liquor first through a boiler provided with a reflux condenser and then through a column still, the ammoniacal vapours from the still being returned to the boiler through a pipe terminating in a rose below the level of liquor in the boiler. The vapours from the boiler pass into the receptacle for the concentrated ammoniacal liquor, which is provided with means for ensuring intimate contact between the liquor and the distillation gases passing through.—A. S.

Saturator for the production of ammonium sulphate from distillation gases. Berlin-Anhaltische Maschinenbau A.-G. Ger. Pat. 279,134, Jan. 16, 1914.

THE gases are introduced through one or more long hoods, dipping in the liquid and extending across the width of the saturator. Between the hoods, and at right angles to them, are partitions which divide the upper part of the bath of liquid into zones and also separate the hopper-shaped wells in the bottom of the saturator from one another. By this subdivision of the space within the saturator the effects of variations in the pressure of the gases are minimised.—A. S.

Hydrogen; Apparatus for the manufacture of — F. Bergius, and Chem. Fabr. A.-G. vorm. Moritz Milch und Co. Ger. Pat. 277,501, Nov. 30, 1913. Addition to Ger. Pat. 254,593 (this J., 1913, 195; see also Fr. Pat. 447,080 of 1912; this J., 1913, 364).

AN apparatus for the production of hydrogen by the action of metals on liquid water under pressure, consists of a pressure vessel within which is a central heating tube and around the latter a series of reaction tubes, each of which can be brought in turn below a feed opening in the cover of the pressure vessel.—A. S.

Hydrosulphites; Process for the electrolytic preparation of — Badische Anilin und Soda-Fabrik. Ger. Pat. 278,588, July 7, 1912.

THE process described in Ger. Pat. 276,059 (this J., 1914, 920) is made continuous by circulating the bisulphite solution from a reservoir, through the electrolysing vessels and back to the reservoir.

the bisulphite being renewed by the introduction of sulphurous acid. When the solution becomes sufficiently concentrated, hydrosulphite crystallises out and is separated and the mother-liquor returned to the circuit. A series of cells connected electrically in parallel is used. The bisulphite solution is preferably prepared by adding sulphurous acid to a sulphite solution immediately before introducing the solution into the electrolysis cells, and the solution leaving the cells is neutralised. To prevent loss of sulphite and hydrosulphite by migration of ions, a vigorous circulation of liquid is produced through the diaphragm, or through a series of diaphragms, in the direction of the cathodes.—A. S.

Hydrogen peroxide; Vessels [of quartz glass or the like] for the preparation and storage of—. Zirkonglas-Ges. m. b. H. Ger. Pat. 278,589, Oct. 1, 1912.

VESSELS of quartz glass or other highly acid glasses, or quartz glass in which a small proportion of the silica is replaced by another acid oxide, such as oxide of titanium or zirconium, are used.—A. S.

Selenium dioxide; Preparation of—. W. D. Treadwell and E. Fränkl. Ger. Pat. 279,005, Dec. 24, 1913.

SELENIUM dioxide is produced by burning an intimate mixture of selenium vapour and air.—A. S.

Salts of complex fluorine acids; Manufacture of—. Gebr. Siemens und Co. Ger. Pat. 279,011, May 1, 1913.

A MIXTURE of an oxide or salt (carbonate, chloride) of a metal and an oxygen-compound of an element capable of forming a complex acid with hydrofluoric acid (e.g., boric acid, titanous acid, silica) is treated with the calculated quantity of hydrofluoric acid.—A. S.

Silicic acid; Preparation of pure—of great absorptive and adsorptive power. R. Marcus. Ger. Pat. 279,075, Feb. 20, 1914.

SOLUTIONS of water-glass are treated with aldehydes, such as formaldehyde, or phenols, and the resulting jelly is washed and dried.—A. S.

Oxygen; Process for removing—from gaseous mixtures. Siemens und Halske A.-G. Ger. Pat. 279,132, June 28, 1913.

THE gases are led over a metal heated to incandescence, the metal being one, such as zirconium or titanium, the oxide of which is not reduced by hydrogen or carbon monoxide at the temperature of working. In practice gases to be freed from oxygen frequently contain hydrogen or oil vapours: by the process described, oxygen can be removed from such gases without formation of steam.—A. S.

Dicyanodiamide or a mass consisting essentially of dicyanodiamide; Manufacture of—from crude calcium cyanamide. G. Grube and J. Krüger. Ger. Pat. 279,133, June 5, 1913.

A PORTION of the lime in an aqueous extract of crude calcium cyanamide is precipitated or combined with an acid, or free cyanamide is added to the solution, so that the quantity of residual free lime (capable of titration with hydrochloric acid) is equivalent to about one-fourth of the total cyanamide content, and this ratio is kept approximately constant by further additions during the spontaneous transformation of the cyanamide into dicyanodiamide at a temperature preferably above 40° C. In the case of solutions of cyanamide free from lime, the requisite alkalinity may be produced by addition of hydroxides or alkaline salts of potassium, sodium, lithium, barium, or strontium. (See also this J., 1914, 75, 740).—A. S.

Cyanamides; Process for producing—. Dettifoss Power Co., Ltd., and J. H. Lidholm, London. Eng. Pat. 28,629, Dec. 11, 1913. Under Int. Conv. Feb. 24, 1913.

SEE Fr. Pat. 465,473 of 1913; this J., 1914, 644. Reference is directed, in pursuance of Sect. 7, Subsect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 2514 of 1874, 15,306 of 1899, 9522 of 1903, and 19,870 of 1906.

Calcium cyanamide; Process of producing—. J. H. Lidholm, London. U.S. Pat. 1,125,350, Jan. 19, 1915. Date of appl., Feb. 14, 1914.

SEE Fr. Pat. 469,045 of 1914; this J., 1914, 962.

Sea-weed products; Manufacture of—. Norsk Tangsyndikat, Christiania, Norway. Eng. Pat. 5145, Feb. 27, 1914. Under Int. Conv., March 1, 1913.

SEE Fr. Pat. 469,190 of 1914; this J., 1915, 28.

Thionyl chloride; Process for producing—. H. von Kéler, Leverkusen, Germany, Assignor to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,125,114, Jan. 19, 1915. Date of appl., Sept. 4, 1913.

SEE Ger. Pat. 275,378 of 1913; this J., 1914, 831.

Hydrogen gas; Process of purifying—. C. Bosch and W. Wild, Assignors to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,126,371, Jan. 26, 1915. Date of appl., Jan. 30, 1912.

SEE Fr. Pat. 439,262 of 1912; this J., 1912, 722.

Utilisation of coke-oven gas and the recovery of by-products therefrom. Eng. Pat. 1820. See IIa.

Manufacturing utensils from oxides of the rare earths, thorium oxide, zirconium oxide and the like. U.S. Pats. 1,121,889 and 1,121,890. See VIII.

Reinforced concrete cell for the electrolysis of salt, etc. U.S. Pat. 1,125,201. See XI.

Anode for the electrolysis of sulphate solutions. Ger. Pat. 278,038. See XI.

VIII.—GLASS; CERAMICS.

Notes on glass. National Physical Laboratory. See p. 210.

PATENTS.

Potters' slip, powdered substances, and the like; Sifting apparatus for treating—. T. Lawrence, Stoke-on-Trent. Eng. Pat. 26,224, Nov. 15, 1913.

TWO skeleton sifting boxes, fitted with detachable lawn frames, are mounted on a common, central axis, one inside the other, the lawn of the inner frame being of coarser mesh than that of the outer one. The inner box is supported within the outer one, so that it can be easily removed. Sifting is effected by rotating the boxes, centrifugal force throwing the slip or powdered substances against the lawns.—O. R.

Refractory products; Manufacture of highly—, during which spinel is formed in the mass. K. A. Mankau, St. Petersburg. Eng. Pat. 29,082, Dec. 17, 1913.

HIGHLY refractory products are produced by burning 6% of an oxide or oxides of the type RO and/or R₂O, with limestone, or with a mixture of limestone and 4–12% of magnesite or chrome iron ore, so that polybasic and polyacid spinels

are always formed in the mass, as described in Eng. Pat. 23,725 of 1912 (this J., 1913, 489).—O. R.

Rare earths, thorium oxide, zirconium oxide, and the like; Methods of manufacturing utensils and the like from the oxides of the —. A. Arnold, Charlottenburg, Assignor to O. Knöfler und Co., Plotzensee, Germany. U.S. Pats. (A) 1,121,889 and (B) 1,121,890, Dec. 22, 1914. Dates of appl., Dec. 20, 1913 and May 12, 1914.

(A) A MIXTURE of a rare earth oxide, e.g., zirconium oxide, and a completely volatile medium, such as water, is compressed in a mould and the product burnt; or a mixture of thorium and zirconium oxides with water is shaped by pressure and, before burning, glazed with thorium and zirconium oxides and a proportion of an additional oxide dependent on the fusing point desired. (B) Oxides of thorium and zirconium are subjected to a high pressure, and then made into a paste with a suitable fluid. The mass is cast in moulds and the shaped articles, which may be glazed as above, are burnt.—F. SOBN.

Saggars for porcelain ware; Preparation of bodies for, and utilisation of sherds of —. F. Singer. Ger. Pat. 278,594, Jan. 11, 1913.

SLAKED lime is incorporated with the other usual components of bodies for saggars for burning porcelain, and the sherds of the used saggars are utilised as an artificial stone for the preparation of mortars.—A. S.

Enamelling; Muffle-furnace for —. O. Zahn, Berlin. U.S. Pat. 1,124,380, Jan. 12, 1915. Date of appl., Sept. 16, 1913.

SEE Fr. Pat. 460,104 of 1913; this J., 1914, 25.

Ceramic and other porous objects; Process for impregnating [waterproofing] —. M. Grünzweig, Ludwigshafen, Germany. U.S. Pat. 1,124,891, Jan. 12, 1915. Date of appl., May 28, 1908.

SEE Fr. Pat. 390,456 of 1908; this J., 1908, 1063.

Vessels [of quartz glass or the like] for the preparation and storage of hydrogen peroxide. Ger. Pat. 278,589. See VII.

IX.—BUILDING MATERIALS.

Wood; Density of wood substance and porosity of —. F. Dunlap. J. Agric. Research, 1914, 3, 423–428.

DETERMINATIONS made with longleaf pine (*P. palustris*, Mill.), Douglas fir (*Pseudotsuga taxifolia*, Lam.), Pacific yew (*Taxus brevifolia*, Nutt.), mockernut hickory (*Hicoria alba*, L.), beech (*Fagus atropurpurea*, Marsh.), red oak (*Q. rubra*, L.), and sugar maple (*Acer saccharum*, Marsh.), showed that for practical purposes the density of the wood substance in different species of trees may be considered as uniform, with a value of 1.54. Most commercial woods have an apparent density between 0.3 and 0.6, so that from four- to two-fifths of the total volume consists of empty cell space.—W. E. F. P.

Building materials (cements and mortars). Tätigkeitsbericht des Kgl. Materialprüfungsamtes zu Berlin-Lichterfelde für das Jahr 1913/14. Chem.-Zeit., 1915, 39, 61–62.

TEST-SPECIMENS of cement mortars of different composition proved not to be completely waterproof, but when coated with a 1 cm. layer of a mixture of 1 part of cement and 3 parts of sand

by vol., and the surface rendered smooth by dusting on cement, they resisted water completely up to a pressure of 4 atmospheres. This result shows that in testing mixtures for rendering mortar or concrete waterproof or water-repellent, the surface of the test-specimen should not be coated with a smooth layer of cement before applying the mixture to be tested. A defective finishing mortar proved to be composed of slaked lime, blast-furnace slag, argillaceous limestone, and tolerably coarse-grained quartz sand. Owing to the high content (about 26%) of clay, which absorbed water with increase of volume, the mortar was not capable of resisting rain, snow, etc., and its adherence was also affected injuriously by the coarse grain of the sand.—A. S.

Carbide sludge; Use of — in building. K. Schumann. Chem.-Zeit., 1915, 39, 43.

WASTE carbide sludge from the manufacture of acetylene when mixed with 40% of sand gave an excellent mortar which hardened in 24 hours. The sludge had the following percentage composition: 14.40% CaCO₃, 0.20 CaS, 24.31 CaO, 0.03 SO₂, 0.16 S, 0.01 Cl, 0.88 Fe₂O₃+Al₂O₃, 1.29 SiO₂, 46.40 H₂O, 0.08 C, 0.06 P₂O₅.—J. R.

PATENTS.

Plaster; Manufacture of —. J. M. Brothers, Prestwich, Lancs. Eng. Pat. 10,130, April 24, 1914.

RAW gypsum and anhydrous quicklime are ground, mixed, and heated to 212°–300° F. (100°–149° C.), whereby the water of crystallisation of the gypsum is driven off and absorbed by the lime, producing a dry plaster. If the quicklime is in excess, steam is admitted to complete the hydration of the lime.—O. R.

Road-making and the like; Materials for —. E. J. Lovegrove and N. G. Crompton, London. Eng. Pat. 12,073, May 15, 1914.

A GROUTING or binder is composed of 30–70% of bituminous material intimately mixed with 70–30% of clinker, ash, or residue from refuse- or dust-destructors, in the form of an impalpable powder, as obtained, for example, from a suction dust-collecting device connected with the grinding machine.—O. R.

Cement; Process of making hydraulic —. W. R. Warren. New York. U.S. Pat. 1,123,964, Jan. 5, 1915. Date of appl., March 6, 1914.

MATERIAL containing chiefly lime (or lime and magnesia), silica, and alumina, is fused under non-reducing conditions, and the molten material is subdivided into small particles in presence of a spray of a solution of a salt, e.g., magnesium sulphate, capable of forming Sorel cement or its equivalent. The solid particles are removed quickly from the spray, and ground with a small quantity of a substance capable of accelerating the set of the cement. The product is a hydraulic cement containing about 50% CaO or CaO+MgO.—A. S.

Lumber; Drying [and preserving] — and product thereof. G. W. and G. B. McMullen, Picton, Ontario. U.S. Pat. 1,125,862, Jan. 19, 1915. Date of appl., April 6, 1914.

TIMBER, such as railway sleepers, is heated gradually in a closed kiln to not higher than 130° F. (71° C.). At first the atmosphere of the kiln is practically saturated, and the heating is continued with gradually decreasing humidity until the sleepers are dried, the atmosphere of the kiln being continually circulated. A germicidal and

water-protective material is then applied. The strength is not impaired, and the moisture content is reduced to a degree sufficient to prevent injurious action of fungi and bacteria.—B. N.

Dry rot of wood; Process for preventing — W. Lichty. Ger. Pat. 278,441, Dec. 20, 1913.

WOOD is treated successively with a solution of a lead or mercury salt and a solution of a silico-fluoride, or directly with a mixture of such solutions.—A. S.

Acid- and fireproof bodies; Method of producing — I. Schlossberg, Hamburg, Germany. U.S. Pat. 1,126,659, Jan. 26, 1915. Date of appl., July 15, 1913.

SEE Ger. Pat. 258,633 of 1911; this J., 1913, 605.

[Silk cotton] *insulating material*. Eng. Pat. 1133. See V.

Preparation of bodies for, and utilisation of sherds of saggars for porcelain ware. Ger. Pat. 278,594. See VIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Steel-making furnaces; Electric — T. D. Robertson. Engineering, 1915, 99, 176—178.

THE Kjellin (this J., 1907, 475, 1055; 1908, 816; 1909, 1047) and Röchling-Rodenhauser induction furnaces (this J., 1912, 137) are dealt with. The arc furnaces are divided into two main classes, namely arc-radiation and arc-conduction furnaces. Of the former the Stassano (this J., 1911, 1067; 1913, 95; 1914, 554) and the Rennerfelt (this J., 1912, 1188; 1914, 599, 837, 1210), and of the latter the Héroult (this J., 1902, 1237; 1907, 878, 1055, 1285; 1909, 147, 377), the Girod (this J., 1905, 739; 1909, 1204; 1910, 95, 96, 361, 827; 1911, 32, 35), and that devised by Grönwall, Lindblad, and Stalhane (this J., 1906, 1054; 1907, 622, 878; 1908, 410; 1909, 1047) are described. A description is also given of the working of a typical charge with a four-ton furnace of the last-named type, the melting current being about 5500 amps. at about 75 volts on each phase. The charge is first purified to remove the impurities with the exception of the bulk of the sulphur. The carburising constituents (powdered anthracite, etc.) are then added and a further purifying slag (lime, sand, and fluorspar), and the current is lowered to about 2000 amps. at about 50 volts pressure. Powdered anthracite is added to reduce any oxide of iron, and at the same time the sulphur passes into the slag. A small quantity of aluminium is added to remove traces of gases, and the metal is poured into the ladle. As far as can be ascertained, there is not much difference in the actual power needed to do the same work with the different types of the better known furnaces. In melting cold scrap, using two slags and refining to a first class quality, the approximate energy consumption decreases from 850 kw.-hours per ton in the case of a 2-ton furnace to 700 kw.-hours per ton in the case of a 5-ton furnace.—B. N.

Arsenic; Determination of — in iron, steel, and ores. A. Klein. Chem.-Zeit., 1915, 39, 43. (See also this J., 1903, 1064.)

THE iron or steel (10 grms.) is treated gradually with nitric acid of sp. gr. 1.2 (120 c.c.), the solution is evaporated to dryness, and the residue then kept upon a hot plate till the evolution of

brown fumes ceases. After cooling, the residue is dissolved in hydrochloric acid of sp. gr. 1.19 (100 c.c.) by warming gently, so that no arsenious chloride volatilises. The solution is washed into a 300 c.c. conical flask and heated on a water-bath to eliminate any remaining smell of chlorine. Potassium bromide (1 grm.) and hydrazine sulphate (3 grms.) are added to the cold solution, the flask is connected by means of a long, jointed glass tube to the upper end of a spiral condenser, and the distillation proceeded with until most of the liquid has passed over and the residue starts bumping. The distillate should contain the whole of the arsenious chloride, but no iron or free chlorine; it is diluted with an equal volume of water and saturated with hydrogen sulphide. After the precipitate has settled, the excess of hydrogen sulphide is expelled by passing carbon dioxide; the sulphide is collected upon a filter and washed with cold water till the filtrate gives no cloudiness with silver solution. The precipitate is washed through the filter with ammonia (sp. gr. 0.96) followed by cold water, into 50 c.c. of ammoniacal cadmium solution (20 grms. of cadmium sulphate in 400 c.c. of water with 600 c.c. of ammonia of sp. gr. 0.96). The precipitated cadmium sulphide, after settling, is collected, washed with water, and stirred, together with the filter-paper, into conductivity water (100 c.c.). Starch solution (2.5 c.c.) and dilute hydrochloric acid (75 c.c. of a mixture of 850 c.c. of conductivity water with 300 c.c. of concentrated acid) are added, and the mixture is titrated at once with standard iodine solution (7.928 grms. of iodine and 25 grms. of potassium iodide per litre; 1 c.c. = 1 mgrm. S = 0.00156 grm. As). The starch solution is made by boiling 5 grms. of starch with 500 c.c. of water, adding a pinch of salicylic acid during the boiling, and finally replacing the evaporated water. Seven sets of very concordant results are quoted, e.g. 0.054, 0.055, and 0.056% As. (See also Clark; this J., 1887, 352.)—J. R.

Pyrophoric alloys (of iron and cerium); Rapid determination of iron in commercial — I. Bellucci. Annali Chim. Appl., 1915, 2, 366—369.

FROM 0.2 to 0.3 grm. of the sample is dissolved in a small quantity of cold, concentrated hydrochloric acid, the solution is diluted with a small quantity of water and then, without filtering, is warmed and treated with hydrogen sulphide. The precipitate, consisting mainly of sulphides of metals present as impurities (copper, lead, antimony), is filtered off, and the filtrate, after expelling the excess of hydrogen sulphide, is treated with 5—10 c.c. of a 3% solution of hydrogen peroxide, evaporated to dryness, the residue dissolved in very dilute hydrochloric acid, and the iron determined iodometrically.—A. S.

[Aluminium.] *Southern Aluminium plant of North Carolina*. C. Hafer. Min. and Eng. World, Jan. 16, 1915, 131—135.

THE plant, which is in course of erection, is designed for the production of 12,000 tons of aluminium annually by the electrolysis, in 400 furnaces, of alumina dissolved in fused cryolite. The power for the hydro-electric plant of 45,000 kilowatts mean capacity is to be obtained from the Yadkin river. The alumina is to be obtained from imported bauxite by treatment with concentrated sodium hydroxide solution and reprecipitation. The hearths of the furnaces are made of carbon blocks and form the cathodes. The anodes, also of carbon, are suspended over the interiors of the furnaces and are not in contact with the sides and bottoms. Each furnace requires 20,000 amps. at 7 volts. Heavy aluminium rods will conduct the current direct from the generators.—T. St.

Palladium; The diffusion of hydrogen through —. A. Holt. Roy. Soc. Proc., 1915, A 91, 148—155. (See also this J., 1914, 571.)

THE pressure-time curve for the diffusion of hydrogen at 700 to 100 mm. pressure through palladium at 100° to 300° C. consists of two portions corresponding to the existence of two allotropic forms of the metal. The rate of diffusion is directly proportional to the pressure of the gas. Below 100 mm. the diffusion is slower and no such simple relationship exists.—J. R.

Welding by the thermit process. Patents avoided.

It is announced in the Illustrated Official Journal (Patents) of Feb. 24th, 1915, that Goldschmidt's Patents Nos. 10,859 of 1901 and 24,439 of 1902 have been "avoided" by the Board of Trade. These patents deal with the welding of metals by the "thermit" process. The trade mark "Thermit" (No. 246,269) has also been avoided, whereby the word becomes public property.

Action of acetylene upon metals. Reckleben and Scheiber. See 11a.

PATENTS.

[Iron] ores; Process of smelting —. F. J. Mac-halske, Plattsburg, U.S.A. Eng. Pat. 15,457, June 27, 1914. Under Int. Conv., June 27, 1913.

IRON ore is smelted in a graphite-lined electric furnace, with lime and artificially prepared graphite. The latter has the advantage over other forms of carbon of not introducing impurities into, and of combining only to a very small degree with the molten iron.—T. St.

Iron ores and other substances containing iron; Process for reducing —. F. C. W. Timm. Ger. Pat. 277,282, May 9, 1912.

THE charge is heated in a shaft furnace by means of oxidising gases and then reduced by reducing gases, the gases passing in both cases downwards through the shaft. With certain kinds of raw materials, the preheating may be restricted to a portion only of the charge, the sensible heat of the reducing gases subsequently introduced serving to heat the remainder.—A. S.

Pig iron; Production of a special ore for the manufacture of —. L. Franck-Johannson. Ger. Pat. 278,780, May 11, 1912.

CALCAREOUS minette or oolitic iron ores are roasted, and after removal of a portion of the lime, by washing with water for example, are mixed with silicious minette ores or other silicious iron ores and briquetted. The ores are mixed in such proportions as to yield a singulosilicate slag. Manganese ore and fuel may also be incorporated with the mixture, and the mixed ores may be heated with carbon or other reducing agent and thus converted into a mass containing a high proportion of reduced iron, in order to prevent passage of iron into the slag.—A. S.

Steel manufacture; Use of collecting vessels for the slags produced in —. F. Dahl. Ger. Pat. 279,542, Jan. 10, 1914.

THE slag is conveyed to collecting vessels by the transporting devices used for the iron or steel, and is thence led directly into small moulds in which it solidifies rapidly. The collecting vessels are protected against loss of heat, or may be heated, in order to prevent too rapid cooling with consequent diminution of the solubility of the slag in citric acid.—A. S.

Metals [steel coated with copper]; Process of making clad —. W. M. Page, Philadelphia, Pa. U.S. Pat. 1,125,158, Jan. 19, 1915. Date of appl., April 20, 1910.

STEEL articles are provided with a coherent coating of magnetic iron oxide and are then dipped into molten copper until bubbling ceases.—T. St.

Tubular articles [steel tubes coated with copper]; Process of making clad —. W. M. Page, Philadelphia, Pa. U.S. Pat. 1,125,159, Jan. 19, 1915. Date of appl., April 20, 1910.

THE outer surfaces of steel tubes are oxidised by heating in an atmosphere of steam, and are then brought into contact with molten copper, the inner surfaces at the same time being heated to such a degree that the copper actually in contact with the steel is at a higher temperature than the remainder.—T. St.

Metal [steel]; Clad — and process of producing the same. W. M. Page, Ridley Park, and W. Tassin, Chester, Pa. U.S. Pat. 1,125,160, Jan. 19, 1915. Date of appl., Feb. 8, 1911.

A STEEL billet is immersed in molten copper, at a temperature above the melting point of the steel, until sufficient iron has dissolved to remove oxygen and oxides, and a weld film of copper has formed on the steel. Iron is removed from the copper by preferential oxidation and the purified copper is then united to the steel billet.—T. St.

Metals and metallic articles; Heat treatment of — and appliances therefor. T. V. Hughes, Birmingham. Eng. Pat. 908, Jan. 13, 1914.

IN the heat treatment of metallic articles by means of heated inert gases, "dry pickling" is prevented by previously saturating the gases with the vapour of the metal under treatment, and, if desired, with that of another metal. The saturation is accomplished by passing the heated gases through conduits containing particles of the metal, or the article may be surrounded by netting, etc., of the metal, or the heat-treatment chamber or muffle may be painted inside with the dust of the vapour-producing metal.—T. St.

[Lead-zinc sulphide] ores; Concentration of —. A. H. Higgins, and Minerals Separation Ltd., London. Eng. Pat. 1368, Jan. 17, 1914.

THE finely crushed ore is sized, or classified, and the products treated separately for the recovery of their constituents by selective flotation in water containing a small proportion of sodium carbonate and one or more frothing agents (e.g. eucalyptus, Texas, or wood tar oil), for example by the process described in Eng. Pat. 16,141 of 1913 (this J., 1914, 869) or in the apparatus described in Eng. Pat. 21,650 of 1913 (this J., 1914, 1160).—W. E. F. P.

Ores; Process of concentrating —. J. M. Callow, Salt Lake City, Utah, Assignor to Metals Recovery Co., Augusta, Me. U.S. Pat. 1,125,897, Jan. 19, 1915. Date of appl., April 10, 1914.

IN a froth-flotation process, the mineral-bearing froth produced in an open vessel is broken up by the application of suction close to the surface, and the floating product simultaneously discharged.—W. E. F. P.

Furnaces; Electric [smelting] —. J. L. Dixon, Sheffield. Eng. Pats. 4742, Feb. 24, 1913, April 4, 1914, 16,263, July 8, and 17,909, July 29, 1914.

THE furnace is provided with from three to six upper electrodes and one lower electrode, and fed with two- or three-phase currents taken from

two or more transformers. Various methods of connecting the electrodes are described, so that by causing the upper electrodes to supply currents of unequal magnitudes, any desired proportion of current may be caused to flow through the lower electrodes, and hence through the bath and the lining of the furnace, without unbalancing the supply system.—B. N.

Melting pots, crucibles, and the like; Apparatus for regulating and for recording temperatures in —. I. Hall, Birmingham. Eng. Pat. 5889, March 9, 1914.

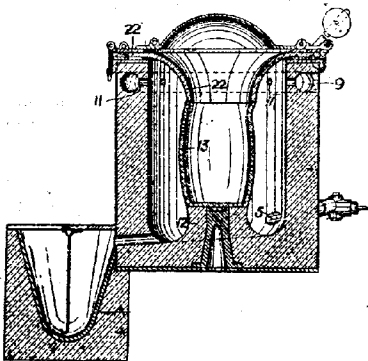
A DETACHABLE vertical pocket, holding a thermostatic apparatus, is secured to the outer wall of a crucible which hangs, by means of a flange round the edge, within an outer gas-fired furnace casing. An aperture in the flange of the crucible allows of the insertion into the pocket of the expansion members of the apparatus for regulating and/or recording the temperature. The interior of the crucible is thus not affected and the action of the mixing apparatus is unimpeded.—T. St.

Metal furnaces; Apparatus for regulating or indicating temperatures in —. I. Hall, Birmingham. Eng. Pat. 6016, March 10, 1914.

In apparatus for regulating temperatures wherein the inner member of a differential expansion device abuts against and actuates a pivoted lever, the end of the expansion rod is recessed to receive a small steel ball which abuts either directly against the lever or against a recess formed on the under side of a yoke piece pivoted to it. A constant leverage is thus produced whatever the angle of the lever may be.—T. St.

Furnace or retort; Metal-melting —. M. Goldberger, Fort Wayne, Ind. U.S. Pat. 1,125,090, Jan. 19, 1915. Date of appl., Aug. 11, 1911.

The crucible, 13 (fig.) rests upon a pedestal, 12, in the heating chamber, and has a removable trumpet-shaped extension, 22, the latter being attached to a flat ring hinged to the top of the



heating chamber and provided with a hinged, dome-shaped cover. The heating gases enter by the orifice, 5, pass through openings, 11, into the horizontal, annular channel, 9, in the furnace wall, and thence to the atmosphere.—W. E. F. P.

[Metallurgical] converter. H. Haas, San Francisco, Cal. U.S. Pat. 1,123,868, Jan. 5, 1915. Date of appl., Jan. 13, 1913.

TUYERES are provided only in the top surface of a central raised portion of the circular bottom of the converter.—A. S.

Metallurgical furnace. U. Wedge, Ardmore, Pa. U.S. Pat. 1,123,965, Jan. 15, 1915. Date of appl., May 3, 1911.

THE furnace is composed of a series of vertical columns arranged in the form of an annulus, opposite columns being connected by transverse girders. Beams above and below the girders cross the latter at an angle, and certain of them are discontinued between the central pair of girders to provide an opening for a central vertical shaft carrying rabblers. The beams have horizontal and vertical flanges, and slabs resting on the horizontal flanges fill the spaces between the vertical flanges. The beams above the girders support the hearth of one chamber, and those below the girders support the roof of the chamber below.—A. S.

Metallurgical furnace. U. Wedge, Ardmore, Pa. U.S. Pat. 1,123,966, Jan. 5, 1915. Date of appl., Feb. 14, 1913.

THE furnace consists of a number of sections separated by alleyways, each section being composed of a row of furnace units. The rabble-arms for the superposed hearths in each unit of a section are carried by a structure which is mounted in the alleyway alongside the section, so that it can be reciprocated therein.—A. S.

Zinc; Method of coating metals with — and apparatus therefor. The British Thomson-Houston Co., Ltd., London. From General Electric Co., Schenectady, U.S.A. Eng. Pat. 9367, April 15, 1914.

A SMOOTH zinc coating of uniform thickness, and of sp. gr. 6.5—6.75, is produced by "sherardizing" at 350°—375° C., using zinc powder containing 80—92% of metallic zinc, the remainder being zinc oxide. Impurities, especially lead, must be excluded as far as possible. The temperature is kept within the narrow limits specified by using a special furnace, preferably heated electrically. A suitable form is described consisting of a rotatable box provided with insulated resistance grids on its walls, and packed on the outside with heat-insulating material. The time required varies with the thickness of the coating from 6 to 12 hours. The coated articles may be bent, swaged, or otherwise deformed at the ordinary temperature without injury to the coating.—T. St.

Metals from [cyanide] solutions; Precipitant for recovering —. G. H. Clevenger, Palo Alto, Cal., Assignor to Merrill Metallurgical Co. U.S. Pat. 1,123,685, Jan. 5, 1915. Date of appl., June 11, 1912.

POWDER made from a brittle alloy of zinc and not more than 3% of an alkali or alkaline-earth metal, e.g. sodium, is used to precipitate metals from cyanide solutions.—A. S.

[Gold and silver.] Amalgamating process. R. Luckenbach, Darby, Assignor to R. Thayer, Philadelphia, Pa. U.S. Pat. 1,124,482, Jan. 12, 1915. Date of appl., Oct. 18, 1911.

ORE pulp is introduced, in a number of distinct streams, below the surface of a mass of a liquid amalgamating reagent; the unamalgamated portion of the ore floats and is removed by means of an independent current of a fluid vehicle.

—W. E. F. P.

[Copper sulphide] ores; Process of sulphatizing —. A. D. Carmichael, Assignor to H. S. Montgomery, Norfolk, Va. U.S. Pat. 1,124,696, Jan. 12, 1915. Date of appl., Nov. 3, 1914.

THE ore is first heated to the decomposition point of iron sulphate, under non-oxidising conditions.

in a mechanical furnace of the superposed chamber type, and then discharged into an oxidising atmosphere, whereby iron and copper sulphides are converted into oxide and sulphate, respectively, and a maximum amount of sulphur dioxide is produced.—W. E. F. P.

Copper and process of producing the same. W. M. Page, Philadelphia, and W. Tassin, Chester, Pa., Assignors to The Duplex Metals Co., New York. U.S. Pat. 1,125,164, Jan. 19, 1915. Date of appl., April 28, 1910; renewed June 18, 1914.

THE copper, in a highly heated condition, is treated with iron in excess of the amount sufficient to react with the oxygen and oxides present. The excess of iron is then burnt out in the presence of carbon, which is made to float on the copper. The purified copper is cast in an inert atmosphere.—T. St.

Lead and antimony; Separation of—by converting the lead into chloride. R. Hesse, G. von Rauschenplat, and T. Schmitz. Ger. Pat. 277,241, July 30, 1913.

THE finely-divided material is intimately mixed with finely-divided chlorides of heavy or alkaline-earth metals, which decompose on heating, and the mixture is heated to redness. Lead chloride is removed from the product by lixiviation, antimony remaining in the residue. By adding an inert alkali or alkaline-earth halide to the charge, or by using a double salt, such as carnallite, as chlorinating agent, and heating to a higher temperature, a mobile melt is produced which separates into two layers, the lower one containing the antimony, and the upper one the lead chloride. The separation may also be effected by heating the finely-divided material to dark redness in a current of gases containing chlorine or hydrochloric acid, and then removing the lead chloride from the product by lixiviation. The process may be applied to oxide ores and metallurgical products, alloys, and speisses, especially those having a high content of antimony and a low content of lead.—A. S.

Zinc oxide; Treatment of finely-divided—[preparatory to smelting]. K. Witte. Ger. Pat. 278,061, Aug. 30, 1912.

THE oxide is moistened with water or other liquid and then heated and simultaneously subjected to a kneading action, so that, on drying, it forms small, dense particles of size ranging from that of millet seed to that of peas. A larger quantity of metal can be recovered from unit volume of the prepared oxide than from ordinary zinc oxide or from zinc ores.—A. S.

Zinc from materials containing it; Process for obtaining— F. C. W. Timm. Ger. Pat. 278,154, Nov. 16, 1912.

ZINC ore or other material containing zinc is mixed with fuel and the zinc is distilled by the heat developed by combustion of the fuel by a current of air or the like. In the first stage of the process a layer of the charge is ignited on a support permeable to gas, and a relatively low temperature is maintained, whilst the charge is supplied either intermittently or continuously until a layer of the desired height is obtained. The temperature is then raised to distil the zinc. In both stages the air or other gas flows downwards through the charge. The process is applicable to all materials from which zinc can be recovered without completely fusing.—A. S.

Tungsten or other high-melting metals of the chromium group, or their alloys; Production of shaped articles, especially hollow bodies of— Chem. Fabr. Reinmetall G. m. b. H. Ger. Pat. 278,156, Feb. 13, 1913.

THE powdered metal is mixed to a paste with water, alcohol, or other volatile liquid, and a mould of plaster or porous clay is coated with the paste, dried, and the mass sintered by heating it electrically. The mould is preferably enclosed in a frame of bars or bands of the sintered metal, and the paste is cast around similar bands or bars, the ends of the latter being subsequently used as contacts for leading in the electrical heating current.—A. S.

(A) *Nickel-cobalt and (B) nickel alloys of high chemical resistance and which can be worked mechanically.* W. and R. Borchers. Ger. Pats. (A) 278,902, July 5, 1913 (Addition to Ger. Pat. 265,076), and (B) 278,903, July 5, 1913 (Addition to Ger. Pat. 265,328).

THE molybdenum in the alloys described in the former patents (this J., 1913, 1160) may be partly or wholly replaced by one or more of the metals, gold, platinum, iridium, osmium, palladium, rhodium, ruthenium, or tungsten.—A. S.

Manganese steel; Method of making— W. G. Nichols, Chicago Heights, Ill., U.S.A. Eng. Pat. 12,762, May 23, 1914.

SEE U.S. Pat. 1,100,905 of 1914; this J., 1914, 792.

Iron and steel; Modification of the method for recovering—[from waste enamelled articles.] A. de Back, Essen, Germany, Assignor to Goldschmidt Detinning Co., New York. U.S. Pat. 1,126,621, Jan. 26, 1915. Date of appl., May 9, 1913.

SEE Eng. Pat. 77 of 1913; this J., 1913, 607.

Tin; Process for electrolytically refining— G. Michaud and E. Delasson, Montreuil, France. U.S. Pat. 1,124,315, Jan. 12, 1915. Date of appl., Sept. 17, 1912.

SEE Fr. Pat. 435,936 of 1911; this J., 1912, 395.

Ores; Method for chloridizing roasting of— A. Ramén and K. J. Beskow, Helsingborg, Sweden. U.S. Pat. 1,124,519, Jan. 12, 1915. Date of appl., May 23, 1911.

SEE Eng. Pat. 23,108 of 1909; this J., 1910, 1459.

Ore-roasting furnace. E. Bracq, Lens, France. U.S. Pat. 1,125,949, Jan. 26, 1915. Date of appl., May 6, 1911.

SEE Addition, dated Feb. 4, 1911, to Fr. Pat. 426,789 of 1910; this J., 1911, 1067.

Casting metals of high melting-point. A. L. J. Queneau, Philadelphia, Pa., Assignor to S. P. Wetherill, Edgewater Park, N.J. U.S. Pat. 1,126,079, Jan. 26, 1915. Date of appl., June 19, 1909; renewed Nov. 25, 1914.

SEE Eng. Pat. 13,304 of 1910; this J., 1911, 901.

Manufacture of briquettes of anthracite, coke, lignite, [ores,] etc. Fr. Pat. 470,949. See IIA.

Process for drawing wires of hard metals [for electric lamp filaments]. Ger. Pat. 278,278. See IIB.

XI.—ELECTRO-CHEMISTRY.

PATENTS.

Carbon articles; Method of compressing baked — and closing laminations and seams therein. J. W. Brown, Lakewood, Assignor to National Carbon Co., Cleveland, Ohio. U.S. Pat. 1,121,792, Dec. 22, 1914. Date of appl., June 6, 1912.

THE article is subjected to pressure, whilst in a plastic state induced by heating, preferably by the passage of an electric current.—F. SODN.

Galvanic cells; Depolariser for —. P. Burger, Berlin. U.S. Pat. 1,123,843, Jan. 5, 1915. Date of appl., July 2, 1913.

A MIXTURE of manganese dioxide and finely-divided, chemically pure carbon (acetylene soot).—W. E. F. P.

Reinforced-concrete cell for the electrolysis of salt, etc. N. Statham, Yonkers, N.Y., Assignor to Industrial Chemical Co., New York. U.S. Pat. 1,125,201, Jan. 19, 1915. Date of appl., Nov. 1, 1913.

A CELL casing of reinforced concrete, of rectangular section and with open sides, is formed in one piece and is provided with openings for the introduction of anodes, and with a brine inlet, cathode drip pipes, and connected cathode exhaust mains embedded in the casing. The portion of the cell normally in contact with the electrolyte, is lined with acid-proof tiles. Cathode elements are clamped against the open sides of the casing, each element comprising a cathode diaphragm, and a co-operating concrete body formed with a cathode chamber. The cathode elements are provided with drip openings co-operating with the drip pipes, and with gas inlets communicating with the upper ends of their cathode chambers, gas and steam mains supplying treating gases to the gas inlets.—B. N.

Anode for the electrolysis of sulphate solutions. H. K. Borchgrevink and R. Molstad. Ger. Pat. 278,038, Oct. 14, 1913.

A PRODUCT of the approximate composition, $\text{Fe}_2\text{O}_3 \cdot 7\text{PbO}$, obtained by fusing together ferric and lead oxides, is used for the construction of anodes.—A. S.

Gases; Producing reactions in — at high temperatures and apparatus [electric furnace] for practising the same. L. L. Summers, Chicago, Ill. U.S. Pat. 1,125,208, Jan. 19, 1915. Date of appl., June 14, 1913.

THE furnace is provided with a pair of electrodes, one of which is water-cooled, arranged at opposite ends of a refractory chamber. The more inert gas is introduced at one end and heated by the arc. A second gas is introduced in the region of the water-cooled electrode and mixed with the heated gas, the final products of the reaction being then withdrawn from the furnace.—B. N.

Electrodes for electric furnaces. F. J. Machalske, Plattsburg, N.Y., U.S.A. Eng. Pat. 15,456, June 27, 1914. Under Int. Conv., June 27, 1913.

SEE U.S. Pat. 1,099,558 of 1914; this J., 1914, 796.

[Silk cotton] insulating material. Eng. Pat. 1133. See V.

Method of making arsenic acid and arsenical compounds. U.S. Pat. 1,125,086. See VII.

Electrolytic preparation of hydrosulphites. Ger. Pat. 278,588. See VII.

Manufacture of matted food. Eng. Pat. 17,113. See XIXA.

XII.—FATS; OILS; WAXES.

Oil content of seeds as affected by the nutrition of the plant. W. W. Garner, H. A. Allard, and C. L. Foubert. J. Agric. Research, 1914, 3, 227—249.

EXCEPT for a period immediately following flowering and that directly preceding maturity, there is a fairly uniform increase in the oil content of soya beans throughout the development of the bean; there is no evidence of any period of intense formation of oil. A similar increase in oil content takes place in cotton seeds. Owing to the physiological relationship of oil to carbohydrate, it appears that maximum production of oil in the plant requires conditions of nutrition favourable to the accumulation of carbohydrate during the vegetative period and to the transformation of carbohydrate into oil during the reproductive period. Partial defoliation (to the extent of 50%) of soya plants reduces the yield of beans, but the size of the beans and their oil content are only slightly affected; the removal of a portion of the blossoms or young pods causes a notable increase in the size of the beans allowed to develop, but does not materially affect the percentage of oil. Different varieties of soya beans grown under the same conditions show marked differences in oil content and size of bean; different varieties of cotton show differences in the size of seed, but little difference in the oil content. In tests carried out with a wide range of soil types and climatic conditions, it was found that the relative effects of different soil types on the oil content of seeds are not specific and constant, but depend largely on seasonal conditions. Under practical conditions, climate is a more potent factor than soil type in controlling the size of the seed and its oil content. Within ordinary limits the relative fertility of the soil appears to be a minor factor in influencing the size of the seed and its oil content. The addition of a complete fertilizer to an unproductive soil causes a larger cotton seed to be produced and increases the percentage of oil; application of nitrogen compounds in increasing quantities does not affect the size of the seed but lowers the percentage of oil, whilst applications of phosphorus or potassium compounds do not affect either character. The size of soya beans is not affected by the addition of phosphorus compounds to the soil, but the oil content is increased; the addition of potassium compounds has no decided effect on either soya beans or earthnuts.—W. P. S.

Olive oil; Studies on the extraction of —. J. Ventre. Ann. de l'Ecole Nation. d'Agric. de Montpellier, 1914, 13, 249—269. Bull. Agric. Intell., 1914, 5, 1506—1510.

THE increased yield of oil due to late harvesting of olives is only apparent, being due to the loss of water by evaporation. The best time for plucking is when the skin is red or black, and without wrinkles; if delayed too long, the yield of oil is diminished. The proportion of oil to dry matter is not sensibly affected by storage, provided ventilation is adequate and the olives are placed in layers not exceeding 18 inches in depth. The quality of the fruit is not diminished by storage for a certain time, and the yield of oil may be increased. Heated olives give a better yield of oil; the optimum temperature (35°—40° C.) oil; the optimum temperature (35°—40° C.) should be obtained by natural fermentation. A comparison of the relative efficiency of hydraulic and mechanical presses, showed that the former have a slight advantage, and should therefore be

employed in large factories. The addition of water gives a better extraction, but hot water is no better than cold.—E. H. T.

Hydrogen; Catalytic addition of — to unsaturated substances. Formation of metallic nickel in hardening oils with the aid of nickel oxide and other nickel compounds. W. Normann and W. Pungs. Chem.-Zelt., 1915, 39, 29—31 and 41—42.

VARIOUS unsaturated oils (100 grms.) were readily hardened (in 2 to 3 hours) by hydrogen (2 litres per minute) in presence of the oxide, hydroxide, carbonate, or formate of nickel (1 grm.) between 200° and 255° C. The formation of metallic nickel during the process was established by an electrical conductivity method, a magnetic method, and two analytical methods, depending, respectively, upon the measurement of the amount of hydrogen evolved with sulphuric acid and the production of nickel carbonyl. Although the carbonyl reaction was not quantitative, it gave reliable qualitative results at 90°, 50°, and 30° C., but in each case rigorous exclusion of air was necessary. Nickel oxide was not reduced under these conditions by carbon monoxide nor by benzaldehyde or formaldehyde at 225° C. On an average the catalyst was shown to contain 4% to 7% of metallic nickel. Rapid hardening was also effected by means of a nickel-kieselguhr mixture, prepared by reduction at 500° C., and containing 4.1% Ni. See also Bedford and Erdmann; this J., 1913, 411.—J. R.

Nickel; Detection of — in hardened oils. F. Prall. Z. angew. Chem., 1915, 28, 40.

EXTRACTION of the oil with hydrochloric acid and detection of the nickel in the acid extract by the dimethylglyoxime reaction is unreliable, as some freshly extracted oils free from nickel give a red coloration. It is recommended that the ash from 100—200 grms. of the fat be extracted with dilute hydrochloric acid, the acid extract heated to eliminate most of the acid, ammonia added, and after standing a few hours the precipitated iron and aluminium filtered off, and the filtrate tested for nickel with alcoholic dimethylglyoxime solution.—R. G. P.

Detection and determination of free or combined glycerol. François and Boismenu. See XX.

PATENTS.

Oil, juice, or fluid from seeds, nuts, fruit, fish, and materials and substances generally which contain oil, juice, or fluid; Machine or apparatus for expressing — also adapted for producing shaped blocks or pieces from plastic materials, substances and the like. G. R. Schueler, Kingston-upon-Hull. Eng. Pat. 501, Jan. 8, 1914.

THE material is crushed between two revolving moulding wheels, on the peripheries of which are teeth which engage with each other to form wedge-like pockets at the base of each two teeth. On each side of the wheels are perforated plates forming side walls to the pockets between the teeth, and the crushed material is expelled through the perforations.—C. A. M.

Oils and the like; Method of extracting —. E. O. Barstow and T. Griswold, jun., Midland, Mich. U.S. Pat. 1,125,920, Jan. 19, 1915. Date of appl., Oct. 9, 1912.

A SOLVENT moving in a closed circuit encounters intermittently, at successive points, the material to be treated whilst this is travelling in the opposite direction, in a closed chamber. The dissolved constituents are separated from the solvent at one point of the circuit.—W. R. F.

Cotton-seed; Method of treating —. A. W. French, Piqua, Ohio. U.S. Pat. 1,121,913, Dec. 22, 1914. Date of appl., July 6, 1914.

PREPARATORY to expressing the oil, the seed is hulled, and the meats and hulls are crushed separately. The meats are then partially cooked with excess moisture, and, when they have passed through the initial "sweat" and a portion of the moisture has been removed, the hulls are introduced, without interrupting the cooking operation, and meats and hulls are cooked together.—F. SODN.

Animal oils; Process for the manufacture of polymerised products from —. W. Kaempfe, Grossenhain, Germany. U.S. Pat. 1,122,400, Dec. 29, 1914. Date of appl., Sept. 30, 1913.

ANIMAL oils are heated with water under pressure, with or without an inorganic catalyst such as manganese sulphate, in order to hydrolyse the more readily hydrolysable glycerides. The hydrolysed products are separated and the residue is polymerised by the aid of heat, e.g., with superheated steam.—J. F. B.

Polymerised oils; Process for obtaining pale-coloured —. Court and Baur G. m. b. H. Ger. Pat. 279,140, Oct. 28, 1913.

THE vessel in which the oil is heated is filled completely and the outlet pipe is sealed in a receiver by a layer of the cold oil to prevent access of air.—A. S.

Hydrogenating fats, oils, and waxes; Process of —. T. B. Walker, Austin, Tex. U.S. Pat. 1,123,962, Jan. 5, 1915. Date of appl., May 22, 1913.

THE fused fatty acid or compound of the same is sprayed by hydrogen under pressure against heated, finely-divided catalytic material in the presence of an electric discharge.—A. S.

Oils; Process of hardening [hydrogenating] —. K. Birkeland and O. Devik, Christiania. U.S. Pat. 1,125,259, Jan. 19, 1915. Date of appl., April 10, 1913.

THE oil, with or without previous removal of volatile substances, is mixed with a catalytic agent and forced from a jet into an atmosphere of hydrogen and thence downwards into a body of the oil, whereby the hydrogen, carried by suction to the bottom of the vessel, is absorbed on rising through the oil. After reduction of the pressure the oil is transferred to another vessel under lower pressure, and then back again to the high-pressure vessel, this circulation being continued until sufficient hydrogenation has been attained.—C. A. M.

Fatty acids and their glycerides; Process for saturating unsaturated — by combining them with hydrogen. E. Utescher, Hamburg, Germany. U.S. Pat. 1,124,560, Jan. 12, 1915. Date of appl., Feb. 10, 1913.

SEE Eng. Pat. 20,061 of 1912; this J., 1913, 797.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Resinous exudation from Aleppo pine and the oil of turpentine obtained therefrom. D. E. Tsakalotos, J. Pharm. Chém., 1915, 11, 70—72.

A SPECIMEN of the resinous exudation of Aleppo pines (*Pinus halepensis*) growing in Attica, Greece, yielded oil of turpentine, 21.4, dry solids (resin), 70.8, solid impurities, 4.5, and water, etc., 3.3%. The oil of turpentine consisted almost entirely of d-pinene (see also this J., 1909, 1050).—W. P. S.

Copals; Action of chlorinated solvents on hard—
C. Coffignier. *Bull. Soc. Chim.*, 1914, 15, 788—789.

The following table shows the percentage of resin insoluble in the hot solvent (see this J., 1903, 808).

	Kind of copal.		
	Zanzibar.	Madagascar.	Demerara.
Ethylene dichloride ..	78.7	70.0	70.5
Ethylene trichloride ..	83.2	70.8	79.2
Ethylene perchloride ..	79.2	68.2	64.2
Tetrachloroethane ..	69.5	37.8	48.7
Pentachloroethane ..	78.4	63.0	53.1

In estimating the insoluble matter it is necessary to drive off the solvent over a naked flame; heating in the oven is insufficient. The use of tetrachloroethane enables Madagascar copal to be differentiated from Zanzibar or Demerara copal.—R. G. P.

PATENTS.

Condensation products from unsaturated hydrocarbons; Preparation of—Chem. Fabr. auf Actien, vorm. E. Schering. *Ger. Pat.* 278,486, May 24, 1913.

ETHYLENE hydrocarbons are condensed with hydrocarbons containing at least two double linkages in the molecule, in presence of anhydrous inorganic chlorides as catalysts; or a portion of the reaction product may be used as catalyst in a succeeding operation. The products may be either solid or liquid and are suitable for use as substitutes for natural resins.—A. S.

Colour lakes; Alumina—P. Tust, Vohwinkel, Germany, Assignor to Synthetic Patents Co., Inc. New York. U.S. Pat. 1,126,591, Jan. 26, 1915. Date of appl., July 7, 1914.

SEE *Eng. Pat.* 15,557 of 1913; this J., 1914, 876.

Colour-lakes, P. Thomaschewski and P. Tust, Vohwinkel, Germany, Assignors to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,126,664, Jan. 26, 1915. Date of appl., July 7, 1914.

SEE *Fr. Pat.* 464,948 of 1913; this J., 1914, 876.

Production of vat dyes of the indanthrene series in a finely-divided condition. *Fr. Pat.* 470,984. See IV.

Manufacture of black, secondary disazo dyestuffs soluble in oils, fats, esters, and similar media. *Ger. Pat.* 278,079. See IV.

Dry deflocculated body [graphite, lampblack, etc.], and method of preparing same. U.S. Pat. 1,116,957. See VII.

Manufacture of polymerised products from animal oils. U.S. Pat. 1,122,400. See XII.

Process for obtaining pale-coloured polymerised oils. *Ger. Pat.* 279,140. See XII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

PATENTS.

India-rubber or similar materials; Machines for washing, macerating, or crepeing—W. G. Gaas, Bolton, Lancs. *Eng. Pat.* 1199, Jan. 16, 1914.

The front, movable roller of a double-roller mill is mounted in arms pivoted to the frame of the

machine, and is adjusted with respect to the back, fixed roller by means of bolts passing through the arm and the frame. The nuts on the bolts may be actuated either separately or by means of a suitable coupling gear; for instance the nuts may be in the form of worm wheels, gearing with a worm on a short shaft provided with a hand wheel.—E. W. L.

Caoutchouc; Process for the manufacture of products from natural or synthetic or synthetic caoutchouc-like substances; and the products obtained thereby. F. E. Matthews and E. H. Strange, London. *Eng. Pat.* 2070, Jan. 26, 1914.

CAOUTCHOUC, rubber, etc., is treated with liquid sulphur dioxide. For example, liquid sulphur dioxide is added to a cooled solution in benzene of synthetic rubber produced by the action of sodium on butadiene, and the mixture is warmed at about 40° C. in a closed vessel. After some time the vessel is opened and the excess of sulphur dioxide removed, when the solution will be found to have increased in viscosity, or have set to a jelly, or a proportion may have been precipitated. The product obtained on evaporation to dryness is an elastic substance resembling caoutchouc, and may be compounded with the usual substances, and vulcanised according to the amount of "vulcanisation" already effected by the sulphur dioxide.—E. W. L.

Rubber-covered metal article and method of making the same. L. Daft, Rutherford, N.J., Assignor to Electro-Chemical Rubber and Manufacturing Co. U.S. Pat. 1,124,302, Jan. 12, 1915. Date of appl., Dec. 24, 1912.

SEE *Eng. Pat.* 2306 of 1912; this J., 1912, 595

Rubber; Process of reclaiming—H. W. Kugler, Assignor to The Firestone Tire and Rubber Co. Akron, Ohio. U.S. Pat. 1,124,920, Jan. 12, 1915. Date of appl., Dec. 20, 1912.

SEE *Fr. Pat.* 466,243 of 1913; this J., 1914, 605

[Rubber] latex; Apparatus for treating—H. A. Wickham, London. U.S. Pat. 1,126,327, Jan. 26, 1915. Date of appl., April 27, 1914.

SEE *Eng. Pat.* 2627 of 1914; this J., 1915, 40

Preparation of erythrene. *Ger. Pat.* 278,647. See XX.

XV.—LEATHER; BONE; HORN; GLUE.

Tanning materials; Potassium cyanide as a qualitative reagent for—H. G. Bennett, Collegium (London), 1915, 56—60.

POTASSIUM cyanide gives a yellow flocculent precipitate with both lentisco (*Pistacia lentiscus*) and sumac, and cannot be used, as Andreasch suggested (see this J., 1898, 933), to distinguish between these materials. The reaction is due to hydroxy ions and is given by sodium and potassium hydroxides. Potassium cyanide with pyrogallol, pyrogallol-tannins, gallic acid, and gallotannic acid, gives a transient bright red coloration which returns on shaking. This reaction, due to oxidation, is given by caustic alkali in the case of gallic acid only. Sodium and potassium carbonates, sodium phosphate and arsenate give a green colour with gallic acid, the oxidation being probably carried to a further stage. Catechol derivatives with the alkali hydroxides and carbonates usually give a transient green colour which changes to red. Catechol itself gives no reaction.

with potassium cyanide. Pyrogallol-tannin develop the red colour. Potassium cyanide may be used in another way to distinguish catechol and pyrogallol-tannins. A 10% solution of cyanide is added to a clear tannin-solution and the mixture poured into an excess of hard water. Pyrogallol-tannins and some mixed tannins give a distinct precipitate, whilst in the case of catechol-tannins the solution remains clear. Some mixed tannins (e.g., mimosa) which answer many of the tests for pyrogallol-tannins, do not give the precipitate.—F. C. T.

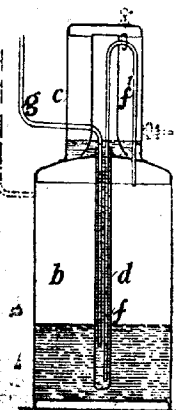
Leather; Determination of nitrogen in—E. Nihoul. *Collegium* (London), 1915, 6—12, 39—42.

In anhydrous copper sulphate be used as catalyst in the Kjeldahl method, the results are too low unless potassium permanganate is also added. The Willfarth modification (*Chem.-Zeit.*, 9, 502), involving the use of mercury, also gives too low results, and requires at least 2—3 hours digestion. In the author's modification 0.7 gm. of leather is soaked with 10 c.c. of concentrated sulphuric acid, and a further 5 c.c. used to wash down any particles on the side of the flask, which is very slowly heated, and the contents boiled for 30 mins. After cooling to 40°—50° C., a few crystals of permanganate are added, and the temperature is again slowly raised; the solution soon becomes colourless, and further heating is unnecessary. A large excess of caustic soda for the distillation is avoided, and zinc dust (tested by a blank determination) is used to ensure gentle ebullition. For carrying over the vapours a long tube of 1 cm. bore, bent twice at 140° is used. Instead of using a spray trap, the part of the tube within the flask has several perforations and a constricted end.—F. C. T.

PATENTS.

Emulsions; Apparatus for separating—especially for separating fat from glue solution obtained by steaming carcasses. E. Meyn. Ger. Pats. (A) 277,281 and (B) 278,891, Jan. 29 and May 16, 1913.

A). The glue solution is introduced through the tube, g, into the cylinder, d, and the heavier aqueous liquid flows through the tube, f, f', into the vessel, b, which is heated by means of steam, whilst the fat, which gradually separates, rises and overflows into c. On starting, a portion of the aqueous liquor also flows into c, and this serves to prevent the fat from coming in contact with the hot over of the vessel, b. The limb, f, of the tube, f', may be in the form of a spiral. (B). The glue solution is introduced from below into a vessel narrow at the top, where it is closed by a stop, and widening towards the bottom where it is connected steam-tight with the bottom of an outer enclosing vessel. The aqueous liquor flows into the outer vessel through a vertical tube opening near the bottom of the inner vessel, and the fat gradually rises and is drawn off through the stop. The inner vessel is surrounded by a steam coil.—A. S.



Leather, and treatment of same. D. B. H. and J. H. Leicester. Eng. Pat. 714, Feb. 10, 1914.

SHOULDER, belly or split leather is given the special properties usually associated with "bottom" leather by treating it with a solution of celluloid, pyroxylin, or cellulose acetate or other cellulose ester dissolved in an organic liquid, or with viscose dissolved in water, and is thus made suitable for "bottom" leather as used for soles, midsoles, and insoles of boots and shoes. Colouring matters, wax, castor oil, or resins may also be added to these solutions. Two solutions claimed for the purpose consist of: (1) celluloid, pyroxylin, cellulose acetate, or the like, 4; acetone, acetone oil, or other ketone, 16; benzol, benzine, or wood alcohol, 31; amyl acetate, amyl alcohol, ethyl acetate, terpenes, or camphor oil, 8; glacial acetic acid, 1 part by weight; (2) celluloid, 6; alcohol (90% or over), 33; methyl alcohol, 21; light ketone (acetone, light acetone oil, etc.), 40; camphor oil, 4 parts by weight. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 983 of 1881, 1753 and 11,734 of 1903, 16,598 of 1906, 28,743 of 1907, and 15,306 of 1909; this J., 1907, 265; 1908, 459.)—T. C.

XVI.—SOILS; FERTILISERS.

Soil carbonates; Decomposition of—W. H. MacIntire. *J. Agric. Research*, 1914, 3, 79—80.

SOILS, although alkaline from excessive treatment with calcium carbonate, are capable of decomposing magnesium carbonate under sterile, moist conditions. The affinity of magnesia for silica is so great that precipitated magnesium carbonate is decomposed by pure silica. In experiments where loamy soils were treated with a quantity of magnesium carbonate equivalent to 15 tons of good grade limestone per 2,000,000 lb. of soil, the carbonate had disappeared entirely at the end of 8 weeks. The affinity of lime for silica is far greater than has been supposed, and the reaction in soils is an important factor in the conservation of lime; it continues long after alkalinity has been attained, but does not approach the magnesia-silica reaction in rapidity. Toxicity due to excessive treatment with magnesium carbonate after its conversion into silicates was demonstrated by the effect on plant growth. (See also this J., 1915, 93.)—W. P. S.

Tetracarboximide, a nitrogenous constituent of soils.

E. C. Shorey and E. H. Walters. *J. Agric. Research*, 1914, 3, 175—178.

TETRACARBONIMIDE, $\text{CO}(\text{NH}.\text{CO}.\text{NH})_2\text{CO}$, was found to be present, sometimes in appreciable quantity, in samples of sandy soil from Florida; these soils have been mentioned previously as containing vanillin and other benzene derivatives (this J., 1914, 432). The compound was also detected in soils from other districts. 18 kilos. of a soil from the grounds of the U.S. Department of Agriculture yielded 30 mgrms. of tetracarboximide, and it is estimated that about 7 lb. was present per acre-foot of soil. It is suggested that the tetracarboximide may be formed in the soil by oxidation of purine bases.—W. P. S.

Soil solution; Influence of the osmotic pressure of—on spring wheat. N. Toulakoff. *La Pédologie*, 1913, 15, 71—103. *Bull. Agric. Intell.*, 1914, 5, 1426—1429.

THE investigation consisted in tracing the effects of solutions of some common salts of sodium,

ammonium, and magnesium at osmotic pressures up to 15 atmos. upon spring wheat grown in zinc pots, containing about 11 lb. of black soil mixed with manure. The control pots were maintained at a constant osmotic pressure by keeping the moisture content at 60% of the maximum. A very pronounced stimulating effect upon the wheat was observed when the (increased) osmotic pressure was 3 atmospheres, but with higher pressures the effects were progressively inhibitive, although the nitrogen-content of the grain was increased. Solutions containing nitrogen, either as acid or base, gave better results as regards yield of grain and straw than non-nitrogenous solutions. Of the latter, sulphates had a greater effect than chlorides.—E. H. T.

Fluorine; Influence of—on vegetation. A. Gautier. *Comptes rend.*, 1915, 160, 194—195. (See also following abstract.)

FLUORINE occurs in living organisms in two forms, always associated with phosphorus. In epidermal tissues, nails, the hair, and other tissues by which it is eventually eliminated, the proportion of the two elements is about the same as in apatite, whilst in the living cells of the glands, muscles, and nerves the proportion of fluorine to phosphorus sinks to 1 to 400. The function of fluorine in these latter tissues was demonstrated by vegetable cultures grown in artificial media of known fluorine content. In most cases fluorine favoured the growth, flowering, and seed production, certain *Sinapis*, for example, producing nine times as many seeds in the fluorinated media. In exceptional cases, such as corn, rye, and oats, its influence remained doubtful, but very rarely was it found to be harmful.—G. F. M.

Maize; Rare mineral elements necessary for the development of—P. Mazé. *Comptes rend.*, 1915, 160, 211—214.

WHEREAS maize will flourish in a medium consisting of a solution in spring water of compounds of N, P, K, Ca, Mg, Si, Fe, Mn, Zn, S, and Ce, if distilled water be substituted for the spring water, the plant will grow fairly well for some weeks, after which further development will suddenly cease, showing that in the latter medium some essential constituents are lacking. Cultures made in the distilled water medium to which some or all of the compounds $Al_2(SO_4)_3$, $Na_2B_4O_7$, NaF, KI, and Na_2HAsO_4 were added, showed that the maize developed in the normal way only when Al, B, F, and I were present in addition to the eleven elements mentioned above. The diminution in weight of the plant when fluorine was absent was particularly noticeable. Arsenic exerted a toxic action and distinctly inhibited the growth.—G. F. M.

Seeds; Heat evolved in the germination of—M. Darsie, C. Elliott, and G. J. Peirce. *Botan. Gaz.*, 1914, 58, 101—136. *Bull. Agric. Intell.*, 1914, 5, 1432.

THE inherent vitality of seeds may be tested by measuring the heat evolved during their germination period. Silvered Dewar flasks were used as calorimeters, and the experiments made upon barley, clover, maize, hemp, oats, and wheat, showed that the heat set free varied directly with the germinating power and with the vigour shown after germination. The older the seeds, the less was the heat evolved. The "normal" temperature, i.e., the average daily increase of temperature due to germination of 10 grms. of seed, was 1.82° C. for hemp, 0.75° C. for clover, 0.73° C. for wheat, 0.55° C. for oats and 0.49° C. for maize. An abnormally high temperature

indicates infection (fungoid); an abnormally low one, lessened vigour due to old age.—E. H. T.

Oil content of seeds as affected by nutrition of the plant. Garner and others. See XII.

Combating sugar beet nematodes. Müller and Molz. See XVII.

PATENTS.

Superphosphates and the like; Method of drying—T. L. Willson and M. M. Haft, Ottawa Assignors to Southern Investment Co. of Canada Ltd., Montreal, Canada. U.S. Pat. 1,122,183 Dec. 22, 1914. Date of appl., Aug. 17, 1912.

SUFFICIENT ammonia is passed over the product of interaction of phosphate rock and sulphuric acid, to form a dry fertiliser, containing ammonium monocalcium phosphate, $Ca(NH_4)H_2(PO_4)_2$, and ammonium sulphate.—O. R.

Fertiliser; Conversion of waste products into a—by heating with sulphuric acid. A. von Krottmaier. Ger. Pat. 278,398, April 20, 1913.

THE waste products are saturated with water containing sufficient sulphuric acid to effect decomposition, then heated by hot air until the mass is liquefied, and finally dried, the whole process being continuous.—A. S.

Fertiliser from sulphite-cellulose waste lyes; Manufacture of a—L. Kern. Ger. Pat. 278,492, Jan. 3, 1914.

THE waste lyes are mixed with kieselguhr containing mineral and organic substances, such as is found, for example, in Algeria, Bohemia, and Virginia. By the combination, in this way, of two practically worthless products, a fertiliser is obtained which is suitable for peaty soils poor in silica and for plants rich in silica, e.g., maize, cereals, grass, etc.—A. S.

Process for destroying plant and house pests. Ger. Pat. 278,448. See XIXb.

XVII.—SUGARS; STARCHES; GUMS.

Sugar production in the United Provinces, India. W. Hulme. *Agric. J. India*, 1915, 10, 54—62.

OF the 896,869 tons of sugar imported into India during 1913—14, about three quarters came from Java. At the present time most of the cane is grown in the United Provinces by native farmers on small and scattered areas, and is crushed in an inefficient manner in bullock-driven mills, but endeavours are being made to organise cultivation, and to extract the sugar in modern factories. During the inter-campaign the sugar factories might be used for the extraction of oil from seeds and for the manufacture of a cattle food from seed cake and residual molasses.—J. P. O.

Sugar beet nematodes; Combating—H. C. Müller and E. Molz, *Z. Ver. deuts. Zuckerind.*, 1914, 64, 959. *Chem.-Zeit.*, 1915, 39, Rep. 18.

LARGE amounts of Chili saltpetre, and its continued application in smaller quantities, favour the attack of nematodes on sugar beets. Sulphur, common salt, and different sugars, have no beneficial action, while the effect of sulphuric acid and sodium hydroxide is questionable. Calcium oxide, on the contrary, destroys the parasite, and is valuable for treating the slimes from the water used in washing infected roots.

Carbon bisulphide is of little practical use, being too volatile; but 2% formaldehyde solution and indiluted allyl alcohol give satisfactory results. Manuring with peat or beet leaves appears to benefit the growth of the nematodes, either because the water-retaining power of the soil is thereby improved, or because constituents favourable to the growth of the organism are supplied. Ploughing the surface of the soil (only about 10 cm. deep) is advantageous, since it promotes the growth of small plants, attracting the nematodes, which can then be removed. Lure plants, following Kühn's method of using them, are efficient, though the procedure is too costly for practical work; destruction of the lure plants by means of 10% ferrous sulphate solution would be preferable. Inundating the infected soil has no useful result, even after a year. In loams rich in humus most of the parasites are found in the upper 30 cm., and the power of migration varies according to conditions, being on the average 56 cm. horizontally in three months, and 50 cm. vertically in a shorter time.—J. P. O.

Sugar; Solubility and crystallising power of — in factory juices and syrups, and the formation of true molasses. H. Claassen. Z. Ver. deut. Zuckerind., 1914, 64, 807. Chem.-Zeit., 1914, 38, Rep., 530.

THERE is no direct relation between the solubility of sugar and the saturation value on the one hand and crystallising power and molasses formation on the other, since from many molasses having a saturation value less than unity, sugar does not separate, whereas in others having a high saturation value crystallisation proceeds readily. Moreover, the effect of non-sugars upon the solubility of sugar does not correspond with their action upon the crystallising power, so that the molasses-forming power of non-sugars can only be determined by experiments in which sugar is crystallised from supersaturated solutions under the most suitable conditions, and not by solubility determinations. Work carried out by Köhler, Schukow, Schnell, Geese, and Prinsen Geerligs shows that with impure solutions the saturation value depends upon the amount and nature of the non-sugar, as well as upon the temperature, which has an important influence, especially with products of low purity. Consequently, generalisations from isolated determinations are untrustworthy, rendering such solubility tables as those of Roppe, Radiss, and Höglund valueless, excepting perhaps when working with syrups of high purity. Recent researches made by the author have shown that both the solubility and saturation values of the hick-juce, and especially of the centrifugal syrups and molasses, of a beet factory show considerable variations during several weeks. On raising the temperature the saturation value always increases, particularly when the purity is low; and with molasses of 66°—54.5° purity the saturation value at 45° C. varies between the extreme limits of 0.80 and 1.30, considerable differences being also encountered even with products of higher purity. With molasses containing a large amount of lime (which has not been added subsequently) the saturation value is low as a rule, but not always, and not proportionally. Invert sugar, dextro-rotatory substances, ash, and the ratio of mineral to organic matter likewise influence the saturation value, though not in any regular manner. The crystallising power, and consequently the purity of the true molasses obtained, depend very largely upon the temperature, as well as upon the nature of the non-sugar, but not upon the saturation value; the purity may vary between 54.3° and 61°. In this connection also, all the non-sugar substances have an undetermined influence, making the customary analyses devoid of any reliable information. It is

boiling in the factory, the author's tables and apparatus should be used, while in crystallising operations the temperature and quantity of water added must be carefully controlled according to the water content and purity of the molasses, the quality and uniformity of the crystals obtained being also observed.—J. P. O.

Molasses; Stanek's new method for the determination of sucrose by double polarisation in beet —. Z. Zuckerind. Böhm., 1914, 39, 8. Chem.-Zeit., 1914, 38, Rep., 530.

UNDER the auspices of the Verein der Zuckerindustrie in Böhmen, Herles, Koydl, Novotný, and Urban have examined Stanek's new method of double polarisation (this J., 1914, 705), in which the direct reading is taken in the presence of exactly the same amount of potassium chloride and citric acid as the inversion reading, clarification being effected with bromine water in place of lead acetate. It was concluded unanimously that the process is both accurate and readily carried out, and that it gives values 0.5 to 1.5% higher than the ordinary double polarisation procedure, and very close to those obtained by direct polarisation. Herles, however, recommends the use of basic lead nitrate in place of bromine, and both he and Urban point out the necessity of establishing new dilution constants for the modified method of working, those of Herzfeld being no longer applicable.—J. P. O.

Alkylated sugars; A new method of preparing —. W. N. Haworth. Chem. Soc. Trans., 1915, 197, 8—16.

METHYLATED derivatives of sugars and other carbohydrates can be prepared by the action thereon of dimethyl sulphate and sodium hydroxide. The sugar is dissolved in the minimum quantity of water in a wide-necked flask with a cork fitted with two dropping-funnels, a condenser, and a mechanical stirring apparatus, and the flask is placed in a water-bath at 70° C. About three times the quantity of methylating agents theoretically required are employed, the alkali (a 30% solution of sodium hydroxide) being in slight excess. These are added to the solution in the flask from the funnels in the course of an hour, the mixture being stirred continuously; the temperature is subsequently raised to 100° C. for about half an hour. The mixture must be kept slightly alkaline during the whole operation. The product is cooled, extracted twice with chloroform, the extract dried, and the chloroform distilled. The aqueous residue may be re-methylated with smaller quantities of the reagents after suitable concentration. From sucrose, heptamethylsucrose is the highest derivative obtainable in this manner, but the octamethyl compound may be prepared by two subsequent treatments by the ordinary method. Dextrose and lactose yield methylated methylglucosides and methyl-lactosides respectively.—J. F. B.

iso-Dibenzoylglucoxylose. Tutin. See XX.

PATENTS.

Sugar; Preparation of — in the form of fine crystals. J. F. P. Kestner, Lille, France. Eng. Pat. 17,010, July 17, 1914. Under Int. Conv., July 22, 1913.

SUGAR in the form of flour, known as Brazilian sugar or "aréado," is produced by causing melted sugar containing only about 5% of water to flow in a thin layer upon a horizontal surface, to which a rapid horizontal vibratory motion is imparted, and allowing the sugar to cool thereon. For con-

longitudinal vibratory movements may be employed.—J. F. R.

Pastes, adhesives, or the like. H. Milligan, Liverpool. Eng. Pat. 6445, Mar. 13, 1914.

MAIZE root (100 parts) is mixed with a metallic chloride, such as magnesium chloride (up to 50) and/or sodium chloride (up to 22.5 parts), with or without a relatively small quantity of maize flour, farina, or the like.—O. R.

Cane molasses or cane sugar solutions; Process for determining. J. Wetter, London. From M. Weinrich, Yonkers, N.Y., U.S.A. Eng. Pat. 1576, Jan. 20, 1914.

See U.S. Pat. 1,084,772 of 1914; this J., 1914, 212.

Preparation and revivification of animal charcoal. Fr. Pat. 471,295. See IIB.

XVIII.—FERMENTATION INDUSTRIES.

Radioactive emanations; Influence of — on yeasts and on alcoholic fermentation. G. Jacquemin and G. Giurel. La Vie Agric. et Rurale, 1914, 3, 232. Bull. Agric. Intell., 1914, 5, 1505.

RADIOACTIVE emanations have an immediate and continuous stimulative action upon elliptical yeasts. A radioactivity of $\frac{1}{2}$ —1 unit per litre accelerates the fermentation of sugar by yeast, producing a more complete conversion into alcohol. This fact is of value for the fermentation industries, particularly for the wine industry.—E. H. T.

Wines; Production of — by ferments other than wine yeasts. V. Martinand. Rev. de Viticult., 1914, 42, 29—34. Bull. Agric. Intell., 1914, 5, 1503—1505.

THE author has isolated the organised ferments present on the grapes from which a celebrated wine is made, and has found several which are not yeasts, and which, although yielding but little alcohol, impart a characteristic agreeable fruity flavour to the wine. Sixty grapes from a vineyard in Burgundy were found to contain only one elliptical yeast, four apicular yeasts, two torule, one fungal yeast, six ferments causing working in must, and the moulds, *Botrytis cinerea* and *Penicillium glaucum*. The functions of the organisms, other than the elliptical yeasts are to activate the alcoholic yeasts, and to secrete enzymes which accelerate the decomposition of proteins. They probably also utilise the dextrose to some extent and serve to free the must and wine from any free sulphurous acid. They are cultivated separately and added to the must at the same time as the elliptical ferments. Fermentation is very rapid and the floating grape-skins should be cooled by spraying with must from the bottom of the vat. Sulphurous compounds are not necessary as a rule; if used, they should be applied during the initial racking off, and in the later racking if the temperature rises above 35° C. Such selected ferments might be used with pure yeasts. They would impart a new, without affecting the old, characteristic flavour, and there would be no danger of after-fermentation.—E. H. T.

Tartaric acid and potassium; Rapid determination of total — in wines. A. Kling and A. Lassieur. Ann. Patis., 1914, 7, 410—416.

TARTARIC acid may be determined by the following modification of the racemate method (this J., 1910, 451; 1911, 200): 25 c.c. of the wine is treated with

10 c.c. of a 2% ammonium persulfate solution and 20 c.c. of a solution of calcium acetate (16 gm. of calcium carbonate and 120 c.c. of glacial acetic acid per litre); after standing for 20 minutes, the precipitate is collected on a filter, washed, dissolved in dilute sulphuric acid, and the solution titrated with potassium permanganate solution. The result is calculated into grams of potassium hydrogen tartrate per litre of wine; 0.2 gm. per litre is deducted from the amount found as a correction for *l*-tartrate occluded by the precipitate. Potassium is determined by the perchloric method; under the conditions given this method determines the potassium present as salts, organic acids and also as sulphate. The ash of the wine is treated with 10 drops of water and 10 drops of perchloric acid (56° B., sp. gr. 1.615), evaporated at 110° C. until almost, but not all, of the perchloric acid has been driven off; the moist residue, when cold, is treated with 6 c.c. of 97% alcohol containing 0.2% of perchloric acid, the precipitate is collected on a filter, washed with 95% alcohol, washed into a crucible with alcohol, the latter evaporated, and the residue is heated to dull redness for 12 minutes with 3 grms. of sodium carbonate, whereby the potassium perchlorate converted into chloride. The mixture is dissolved in water, 10 c.c. of N/10 silver nitrate is added, followed by 5 c.c. of nitric acid (36° B., sp. gr. 1.32 and 0.5 c.c. of ferric alum solution, and the excess of silver is titrated with N/20 thiocyanate solution. During the titration the sediment of silver chloride should be disturbed as little as possible, since silver chloride reacts to some extent with ferric thiocyanate.—W. P. S.

Potassium hydrogen tartrate and tartaric acid; Determination of —. H. Astruc. Ann. Patis., 1914, 7, 416—417.

KLING'S racemate method (this J., 1910, 451; 1911, 706) has been found to be the most trustworthy method known at present for the determination of tartaric acid and its salts, e.g., in alcoholic drinks, fruit juices, etc.—W. P. S.

Nipa palm swamps in the Philippines as sources of alcohol. U.S. Cons. Rept. Chem. Trade J. Feb. 20, 1915.

THERE are over 100,000 acres of nipa palm swamp available in the Philippines, of which about 80% has never been touched. It is estimated that the nipa sap obtainable in the islands would yield 50,000,000 gals. of alcohol fuel every season. Some of these areas are privately owned, but a large proportion of them is still at the disposal of the Government, and can be leased for 10% of the raw material produced each season. Practically all the alcohol now produced in the Philippines comes from one nipa swamp of about 45,000 acres of which one-third is being worked. The total production of alcohol in the islands is approximately 2,500,000 gals. per season, nine-tenths of which is made from nipa sap. Only 2% of the alcohol now produced is denatured for commercial use. No modern improvements have been introduced in the industry, nor has any attempt been made so far to improve the cultivation or to increase the production of sap. The estimate cost of installing a distilling plant capable of producing 500 gals. a day is a little over £2000, while the daily output cost would be 215, or about 14 per gallon.

PATENTS.

Brewing process with small quantities of hops which the husk have been removed. G. P. Schmitt. Ger. Pat. 278,482, Jan. 10, 1915.

THIS coarse grain used for making malt serves as a filtering medium, and is used in the brewing process.

Method and apparatus for making alcohol. Eng.
Pat. 28,928. See XX.

SKIM-MILK is evaporated and powdered, and mixed with a ground cereal rich in vegetable fat, such as maize, in such proportion as to give a product having the same content of fat as whole milk and a correct nutritive ratio between protein and fat.

—J. H. J.

Rare mineral elements necessary for the development of maize. Mazé. See XVI.

Bread and the like; Predetermining the time necessary for the fermentation or rising of dough for — A. Watkins, Hereford. Eng.
Pat. 19,487, Sept. 5, 1914.

The apparatus consists of a box, about four-fifths of the interior of which is occupied by an inverted jar-shaped receiver. The box has a hinged lid carrying a bell and a spring connected with the bell hammer. To determine the time required to bake a batch of dough, some of the dough is filled into the receiver within the box, the lid is closed, and the box placed in the oven with the bulk of the batch. As the dough rises, the receiver is lifted and pushes up the lid, which releases the spring and rings the bell. When the time taken and the use of a factor of heat is known, from tables the time necessary to bake the whole batch is determined.

In testing for hypochlorite in potable waters sterilised by means of bleaching powder, two drops of methyl orange (1 : 5000) followed by 2 to 3 c.c. of 10% hydrochloric acid are added to 250 c.c. of the water: hypochlorite effects decoloration in a few seconds. Ozone acts similarly. The test is sensitive to 0.1 mgrm. of active chlorine per litre. Methyl red is 20 times as sensitive as methyl orange. In presence of manganese the water must be cleared with alum (0.1 grm. per litre) before applying the test. Active chlorine is estimated by adding 0.2 grm. of very pure potassium iodide, 1 c.c. of starch solution, and 2 to 3 c.c. of 25% phosphoric acid to 100 c.c. of the water, and titrating the liberated iodine with *N*/200 sodium thiosulphate: nitrite is destroyed by bleaching powder, and ferric iron does not liberate iodine in presence of phosphoric acid. Traces of manganese as small as 0.1 mgrm. per litre may be detected by adding 1 drop of methyl orange to each of two portions (250 c.c.) of the water; 1 to 2 c.c. of 10% sodium hydroxide is added to the first portion, and after a few minutes both portions are acidified with 5 c.c. of 10% hydrochloric acid in presence of manganese the first portion is decolorised within 2 minutes. The reaction cannot be applied in presence of hydrogen sulphide: nitrite renders it less sensitive; but it is unaffected by iron. Phosphoric acid is precipitated as ferric phosphate by warming the water (1000 c.c.—in some cases 5000 c.c.) on the water-bath for an hour with 1 c.c. of 10% ferric chloride solution and 2 c.c. of 10% alum solution. The flocculent precipitate is collected on a moistened wad, and the flask and filter are washed three or four times with warm 30% nitric acid in quantities of 10 c.c., whereby the precipitate is completely dissolved. After the addition of a drop of hydrochloric acid the filtrate is evaporated to dryness on the water-bath, the residue dissolved in distilled water, and adding a few drops of nitric acid, the solution

solution filtered, evaporated to 5 c.c., and treated with 5 c.c. of molybdic acid reagent (prepared by adding 500 c.c. of 20% nitric acid to a filtered solution of 25 grms. of commercial ammonium molybdate in 100 c.c. of distilled water and 100 c.c. of 10% ammonia and allowing to stand for several days). Even 0.05 mgrm. of phosphoric acid produces a precipitate after some time. After standing overnight the precipitate is collected upon a wad, washed with 10 to 20 c.c. of the above reagent, and dissolved in the least possible amount of ammonia. The solution is made up with the distilled water washings to 50 (or 100) c.c. and treated with 5 (or 10) c.c. of the molybdic acid reagent. To 55 (or 110) c.c. of distilled water contained in a similar beaker are added 1 drop of ammonia followed by a standard potassium chromate solution (see this J., 1915, 149) until the tint is matched. This operation must be accomplished rapidly. Twice the number of c.c.'s of potassium chromate solution required gives the number of mgrms. of P_2O_5 per litre of the original water. The gravimetric method yields high results for quantities of less than 5 mgrms. P_2O_5 per litre, owing to the presence of molybdic acid in the magnesium pyrophosphate. Of six samples of potable water examined, one gave 0.02 mgrm., four gave 0.05 mgrm., and one gave 0.44 mgrm. of P_2O_5 per litre.—J. R.

Salts; Reactions between certain — in boiling water. P. Petit. *Monit. Scient.*, 1914, 4, 537–541.

SOLUTIONS of pure calcium and magnesium bicarbonates, containing from 36 to 360 mgrms. CaO or MgO per litre, were boiled for 1 hour in a flask fitted with a reflux condenser and immersed in a bath of calcium chloride solution boiling at $110^\circ C$. The solutions were then filtered rapidly and titrated. Under these conditions the percentage of lime precipitated as carbonate diminished with increasing dilution of the solution, but the quantity remaining in solution was constant at about 17 mgrms. CaO per litre. With solutions of magnesium bicarbonate, the percentage of magnesia precipitated and the quantity remaining in solution both diminished with increasing dilution of the solution. In a mixture of calcium and magnesium bicarbonates a more complete precipitation of the lime was obtained, especially with higher concentrations of calcium bicarbonate; the proportion of magnesium carbonate precipitated was unaffected. The presence of sodium chloride reduced the amount of lime precipitated, but increased the amount of magnesia precipitated. Magnesium sulphate added to the calcium bicarbonate solution retained much of the lime in solution, especially when the amount present was small. Calcium sulphate caused a large increase in the precipitation of magnesium carbonate.—J. H. J.

Dust; The moist bacterial — of inhabited places. A. Trillat. *Comptes rend.*, 1915, 160, 153–156. (See also this J., 1914, 1070.)

LARGE glass cylinders holding 60–80 litres were filled with the expired breath of animals or men, together with particles of moisture containing bacteria. In still air at $18^\circ C$. the bacterial particles settled at a rate proportional to their dimensions, those of 1μ diameter at the rate of 1 cm. in 3 min. *Settling was accelerated by sudden cooling of the air, and the organisms were deposited on the cold surface. A fall of barometric pressure, especially if accompanied by a fall of temperature, accelerated the settling of the bacterial particles. When a fan was rotated within the cylinder, subsidiary currents were produced at right angles to the main vertical current,

and under the influence of these currents most of the bacterial particles were maintained in equilibrium. At certain points clusters of the bacterial particles were seen, while in the vertical currents the particles rose and fell. These experiments show that there are disadvantages attaching to revolving fans in ill-ventilated rooms.—J. H. J.

Iodine; Germicidal value of —. T. Maben and J. S. White. *Chem. and Drug.*, 1915, 144.

To test the value of iodine as a sterilising agent in medical practice, the Rideal-Walker test was applied to iodine tincture diluted with an equal volume of 90% alcohol and to an aqueous solution diluted with water to the same strength. The solutions were compared with carbolic acid solutions of 1 in 100 and 1 in 120, using *B. typhosus* as test organism. No growth was obtained in subcultures from the iodine solutions, whereas the carbolic acid solutions permitted growth. Still weaker solutions of iodine ($\frac{1}{2}$ and $\frac{1}{4}$ %) prevented growth, but $\frac{1}{4}$ % solution allowed it. It is concluded that iodine in alcoholic or aqueous solution is about four times as powerful a germicide as phenol on naked organisms.—J. H. J.

Arsenic antidote. J. W. England. *Amer. J. Pharm.*, Feb., 1915. *Pharm. J.*, 1915, 94, 281.

THE following method is recommended for preparing an antidote for arsenic by means of Magma Magnesia N.F.:—40 c.c. of ferric sulphate solution (U.S.P.) is diluted with water to 300 c.c., and in another vessel 300 c.c. of magnesia magma is mixed with an equal volume of water. When the antidote is required, the iron solution is added gradually, with shaking, to the magnesia magma. This method gives a more voluminous magma than when the magnesia is added to the iron solution.

Toxic symptoms among workers in calcium nitrate factories. See VII.

PATENTS.

Sewage and other foul liquids; Aeration of —. W. Jones, and Jones and Attwood, Ltd., Slough-bridge. Eng. Pat. 22,952, Oct. 11, 1913.

A SERIES of diffusers spaced apart and each formed of a porous earthenware plate, on the underside of which compressed air is admitted, is arranged transversely across the bottom of each section of the tank holding the sewage to be aerated. The sewage is transferred from one section of the tank to the next by a circulator consisting of an uptake pipe at the bottom of which compressed air is admitted; the mixture of air and sewage rises and is delivered into the covered top of a downtake pipe, into which air is also admitted below the water level. The lower end of the downtake pipe is enlarged to form a foot chamber, where the excess of air escapes and is passed on to supply the diffusers, while the sewage passes into the bottom of the next section of the tank.—J. H. J.

Trade effluents; Process for removing fat and soap from —. G. Spanner. Ger. Pat. 273,370, Dec. 14, 1912.

THE effluent is agitated or otherwise treated to produce froth, and at the same time a suitable chemical, such as aluminium silicate (clay), is added, the effect of which is to maintain the froth as a floating layer. This layer carries mechanically the suspended and fatty matters present in the effluent, and can be removed in settling tanks of the like.—A. S.

Purification of water; Supply of reagents in the—
F. P. Candy, Sutton, Surrey. Eng. Pat. 782,
Jan. 12, 1914.

A closed chamber containing the aluminium sulphate or other reagent is connected by a pipe at the bottom to the bottom of a closed solution chamber. A portion of the water flowing through the pressure main, which is shaped at one part like a Venturi tube, enters the solution chamber by a pipe a little way above the bottom and passes out by a pipe at the top, back into the throat of the Venturi pipe. When communication is established between the reagent chamber and the solution chamber, the heavy aluminium sulphate solution passes downwards and forms a layer on the bottom of the solution chamber just below the level of the water inlet pipe; the incoming water picks up a little of the heavy solution and carries it forward continuously into the main.—J. H. J.

Water; Process for obtaining drinking—free from pathogenic germs and of any desired degree of hardness. J. C. Bernatrop. Ger. Pat. 278,367, July 11, 1913.

SUFFICIENT calcium hydroxide is added to soften the water and leave a slight excess, *e.g.*, about 0.25 gm. of free CaO per litre, and after allowing to stand, say for 5 hours, to ensure destruction of germs by the excess of lime, a quantity of alkali bicarbonate is added sufficient to produce the desired degree of hardness, the water is filtered, and the alkalinity is exactly neutralised with sulphuric acid.—A. S.

Air; Process of and apparatus for drying and sterilising—R. P. van Calcar, Leiden, J. Ellerman and H. J. Martijn, The Hague. Eng. Pats. (A) 24,159 of 1913; (B) 4018 and (C) 4020 of 1914; date of appl., Oct. 24, 1913. Under Int. Conv., Nov. 29 and Dec. 24, 1912, and July 19, 1913, respectively.

(A) THE air enters around the lower sides of a rectangular box with a conical top connected to a hopper, in the mouth of which is a fan for producing a strong suction through the apparatus. In the body of the box is a tier of trays arranged in zig-zag fashion and carrying the drying agent, calcium chloride, which when liquefied drops downwards to the sloping floor of the box. Above or between the trays are pipes capable of being heated. Cold moist air passing through the apparatus is dried, warmed to normal temperature and nearly sterilised. When treating warm moist air, the pipes are replaced by shallow troughs containing a freezing mixture. (B) The bottoms of the trays are furnished with projecting pegs down which the liquefied calcium chloride trickles. By having air inlets of different sizes on three sides only of the box, the air is made to eddy as it passes through and is brought into better contact with the streams of calcium chloride. (C) A tray situated in the lower portion of the box is furnished with upright pins encased in porous material. This tray catches the liquefied calcium chloride falling from the upper trays and effects a preliminary drying of the air passing through.—J. H. J.

Metals; Process for extracting—from living [human] bodies. T. M. Clague, Newcastle-upon-Tyne. U.S. Pat. 1,123,883, Jan. 6, 1915. Date of appl., Sept. 20, 1913.

A PART of the body near that from which the metal is to be extracted, and a part of the body remote from the former part are each surrounded with a conducting liquid, through which they are connected respectively with the negative and positive poles of a source of electric current, and a current is passed through the body. (See also this J., 1913, 881.)—A. S.

Disinfection by means of heated, compressed air saturated with steam or with a mixture of steam and a disinfectant in the form of gas or vapour. Deutsche Desinfektionszentrale G. m. b. H., Gen. Pat. 278,432, Nov. 10, 1912.

THE compressed air is withdrawn from the lower part of the disinfecting chamber by a fan and passed successively through a heater, a vessel in which it is saturated with steam, and a vessel containing a disinfectant, and then back to the upper part of the disinfecting chamber. Provision is made for supplying fresh air to the circuit, and the disinfecting chamber is fitted with a heating jacket.—A. S.

Plant and house pests; Process for destroying—F. X. Bickel. Ger. Pat. 278,448, Feb. 2, 1912.

INFECTED plants are inoculated with metallic mercury, which is introduced through holes made in the lower branches near the main stem; or the plant or other infected material is exposed to mercury vapour in an enclosed space.—A. S.

Mercury compounds; Manufacture of solutions of—with disinfecting properties and inert towards metals. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 278,734, Nov. 23, 1913.

SOLUTIONS of mercury salts are mixed with soluble silicates and ammonia. A solution of mercuric chloride (1:1000), for example, may be mixed with 10 parts of water-glass of 35° B. (sp. gr. 1.32) and 4 parts of 20% ammonia. The solutions may be used as disinfectants, for wood preservation, anti-fouling paints, etc.—A. S.

Sterilisation of liquids. V. Henri, A. Helbronner, and M. von Recklinghausen, Paris, Assignors to The R.U.V. Co., Inc. U.S. Pat. 1,124,737, Jan. 12, 1915. Date of appl., Dec. 24, 1912.

SEE Fr. Pat. 403,945 of 1909; this J. 1910, 107.

Absorbent medium for carbonic acid gas. Eng. Pat. 12,454. See VII.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Cinchona alkaloids; Volumetric determination of—E. Dufilho. Bull. Soc. Pharm. Bordeaux, 1914, 53. Ann. Falsif., 1914, 7, 453—454.

THE cinchona preparation (bark, extract, etc.) is heated with sulphuric acid in a closed flask on a water-bath, the solution of the alkaloid sulphates thus obtained is rendered alkaline with sodium hydroxide, and the alkaloids are extracted with a mixture of ether and chloroform. The ether-chloroform solution is washed with saturated sodium sulphate solution, an excess of N/10 sulphuric acid is added, the mixture evaporated to remove the ether and chloroform, and the excess of sulphuric acid is titrated in the residual solution, using litmus as indicator. The alkaloids are then liberated by the addition of an excess of sodium hydroxide, extracted with a mixture of ether and chloroform, and the latter solution is evaporated to dryness after the addition of a quantity of sulphuric acid required to combine with alkaloids; a small quantity of ether is added to the residue, and the crystalline mass is extracted with a saturated quinine sulphate solution. The alkaloid sulphates other than quinine sulphate are dissolved and are titrated with N/10 sodium hydroxide solution in the presence of phenolphthalein; the quantity of quinine present in the sample is obtained by difference.—W. P. S.

Opium; Assay of — A. R. L. Döhme, J. Amer. Pharm. Assoc., 1915, 85. Pharm. J., 1915, 94, 209.

Four grms. of powdered opium is exhausted with water, the solution concentrated to 50 c.c., and after making strongly alkaline with caustic potash or soda solution, the alkaloids other than morphine are removed by extracting with ether. The alkaline liquid is then acidified with sulphuric acid, made slightly alkaline with ammonia, and the morphine extracted by shaking with a mixture of equal volumes of chloroform and isobutyl alcohol. The chloroform is first distilled off from the extract and then the isobutyl alcohol under reduced pressure; the residue is dissolved in excess of standard acid and the excess of acid titrated with alkali, using methyl red as indicator.—T. C.

Tobacco plant; Composition of — of various stages of growth. E. Pannain. Bull. Agric. Intell., 1914, 5, 1450—1452.

The plant investigated was the variety Xanthi Yaka, grown at Francaville al Mare in the Abruzzi. Analyses were made of the nursery seedlings, the plants before flowering, of the leaves from each picking, and of the stems and roots. Keller's nicotine-method was accelerated by liberating the alkaloid with 20% potash, extracting with a mixture of equal parts of sulphuric acid and petroleum ether, and titrating with N 10 sulphuric acid in presence of Congo-red. The seedlings contained more nitrogen and organic acids, and gave more ash than the half-grown or fully-grown plants. In the pre-flowering period, the top leaves gave higher figures for ash, nitrogen, and alcohol and ether extracts, than the lower ones; but they contained less nicotine and organic acids. In the ripe leaves (which are picked as they mature from the bottom upwards), the first and second pickings contained 1.42 and 1.52% of nicotine and third and fourth pickings 0.75 and 0.74%, respectively on the dry basis; the amount of ash decreased from the first to the fourth picking. The leaf blades were richer in every constituent, except organic acids, than the ribs; and this holds good for the whole leaves in comparison with the stems and roots. The roots of the seedlings contained 0.80% of nicotine and the stems 0.48%, and those of the plants before flowering, 0.65 and 0.29%, respectively.—E. H. T.

Sempervirene, a new alkaloid of gelsemium. A. E. Stevenson and L. E. Sayre. J. Amer. Pharm. Assoc., 1915, 60. Pharm. J., 1915, 159.

The concentrated alcoholic extract from 5 lb. of gelsemium was repeatedly extracted with chloroform, the chloroform extract concentrated and repeatedly extracted with very dilute hydrochloric acid. The acid liquid was freed from gelsemic acid by treatment with benzene, then extracted with chloroform and the concentrated chloroform extract washed with water. The aqueous extract was evaporated to dryness, distributed over sand and extracted with acetone and then with alcohol. The alcoholic extract on evaporation yielded the hydrochloride of a new alkaloid, *sempervirene*. *Sempervirene* forms pale yellow crystals. Its sulphate, hydrochloride, and nitrate are very sparingly soluble in water; the nitrate is slightly soluble and the hydrochloride readily soluble in alcohol. Only minute quantities of *sempervirene* are present in gelsemium.—T. C.

Struzine, a new alkaloid in *Nux vomica*. H. H. Schaefer. J. Amer. Pharm. Assoc., 1914, 1677. Pharm. J., 1915, 94, 241.

A NEW alkaloid, *struzine*, has been found in *Nux vomica*, associated with strychnine and brucine. In neutralising the acid solution of the crude alkaloid sulphates of *Nux vomica*, the new alkaloid

separates as a base when the liquor is just neutral or is still slightly acid, while strychnine and brucine remain in solution. When purified by reprecipitation and crystallisation from alcohol, *struzine* was obtained as colourless crystals, which begin to char when heated at about 250° C. Its mol. wt. is 371 and probable formula, $C_{21}H_{30}N_2O_4$. It forms normal and acid salts. Only a few lots of *Nux vomica* contained this substance, and then the quantities yielded differed greatly among the different lots. All the beans which contained this alkaloid were from shipments made from Cochinchina; these lots, which consisted mostly of small beans, insect-eaten and partly decomposed by prolonged exposure in wet fields, contained the largest percentage of the alkaloid (average 0.1%). It is supposed that the new alkaloid is a product of decomposition, by fermentation or oxidation of either strychnine or brucine.

Bark of *Lophopetalum toxicum*; The active principle of the — Galvialo. Pharmazeutisches J., 1914, 515. J. Pharm. Chim., 1915, 11, 78—80.

THE author has isolated from the bark of *Lophopetalum toxicum*, which is used as an arrow poison by the natives of the Philippines, 0.2% of a crystalline substance, $C_{22}H_{34}O_6$, having the properties of a glucoside; this substance was soluble in hot alcohol, ether, benzene, and chloroform, but insoluble in water. When crystallised from benzene or alcohol the m. pt. was 222°—230° C., whilst the crystals obtained from an ether solution had m. pt. 190°—195° C.—W. P. S.

iso-Dibenzoylglucoxylose. F. Tutin. Chem. Soc. Trans., 1915, 107, 7—8.

DIBENZOYLGLUCOXYLOSE (Power and Salway, this J., 1914, 435, 566) melts, after repeated crystallisation from ethyl acetate, at 152°—153° C. In the course of purifying this substance, the author obtained a smaller proportion of *iso*-dibenzoylglucoxylose, melting at 173°—174° C.; $[\alpha]_D^{20}$ —6.3° in 1% solution in methyl alcohol. It crystallises in colourless needles from water or ethyl acetate and is more sparingly soluble than the former compound, which it resembles in general properties. Its penta acetyl derivative melts at 173°—174° C. The occurrence of rutin in *Daviesia latifolia* is also confirmed.—J. F. B.

Propyleneglycol-monoglucoside; Biochemical synthesis, by means of emulsin, of — E. Bourquelot, M. Bridel, and A. Aubry. Comptes rend., 1915, 160, 214—216.

A SOLUTION of dextrose in α -propyleneglycol, $CH_3CH(OH)CH_2OH$, and water after exposure for six months to the action of emulsin, partly at the ordinary temperature, and partly at 33° C., was found to contain a considerable quantity of glucoside, which after separation from the unchanged dextrose and glycol, remained as an almost solid, white, non-crystalline mass. In aqueous solution it had a specific rotation $[\alpha]_D^{20}$ = —30.32°. On hydrolysis with sulphuric acid or emulsin it yielded the racemic glycol, identical with that used as starting material; hence no preferential conversion of one or other of the optical enantiomorphs into glucoside had occurred.—G. F. M.

Papain. H. F. MacMillan. Chem. and Drug., 1915, 133—136.

THE papaw tree (*Carica papaya*) is largely grown in Ceylon, the Hawaiian Islands, and the West Indies for its edible fruits and for the preparation of papain. Papain is prepared by scarifying the nearly mature green fruits, whilst still on the tree, with a bone or ivory knife, and collecting

the milky, viscid exudate in porcelain, glass, or earthenware vessels. The juice rapidly coagulates and must be dried promptly to prevent decomposition: a trace of formalin may be added to the juice as a preservative. The coagulum is sometimes dried in the sun but preferably by artificial means. In Montserrat dryers, 3 ft. by 3 ft. by 6 ft. in length, are used, having sides and ends of brick and open at the top. About 1 foot below the top is an iron sheet on which is a layer of sand 1—2 ins. deep. The coagulum is spread upon brown linen held in frames which fit the top of the dryer, or upon sheets of glass. Drying is effected at a low temperature, sometimes below 100° F. (38° C.). The dried material, when ground, yields a white or cream-coloured powder, which is packed in tightly-closed bottles. The exports of papain from Ceylon for the three years, 1911, 1912, and 1913, were:—

Countries to which exported.	1911.		1912.		1913.	
	Quan.	Value.	Quan.	Value.	Quan.	Value.
U.K. . .	4,054	20,320	9,088	34,332	12,705	44,183
Belgium	—	—	76	229	376	1,881
Germany	2,007	11,401	1,708	7,159	2,555	12,705
U.S. . .	550	2,500	2,048	8,948	2,912	13,078
Total	6,611	34,221	12,920	50,668	18,548	71,847

NOTE.—R.1=1s. 4d.

Considerable difference of opinion exists as to whether Ceylon or West Indian papain is the better, this being largely due to the general practice of adulterating papain, particularly Ceylon papain, with starch, rice, etc. Genuine papain has a slightly salt and somewhat acrid flavour, and a peculiar, characteristic smell. It should be crisp and not sticky. (See also this J., 1915, 100.)—T. C.

Oil of Artemisia absinthium. V. Paolini and R. Lo Monaco. Atti del. Reale Accad. Lincei, 1914, 23, 123—129. Bull. Agric. Intell., 1914, 5, 1448—1449. (See also this J., 1914, 1072.)

FRESH cultivated plants grown near Rome and Perugia gave on distillation about 10% of mixed α - and β -thujone, about 48% of thujol (free and as acetic, isovaleric, and palmitic esters), a mixture of at least two compounds in which β -thujol predominated, phellandrene, cadinene, and a blue oil of unknown composition.—E. H. T.

Vanillin; Note on —. C. F. Boehringer u. Soehne. Chem.-Zeit., 1915, 39, 31—33.

SPECIMENS of vanillin prepared from oil of cloves and guaiacol, respectively, melted alike at 78–95°C., and it should not be difficult to manufacture the pure substance on a large scale from guaiacol, thus rendering the German industry independent of imported cloves.—J. R.

Vanillin in quinine wines; Detection of —. A. C. Chauvin. Ann. Falsif., 1914, 7, 420—422.

A TEST proposed by Lecomte consists in mixing an ethereal extract of the wine with dilute hydrochloric acid and adding an alcoholic solution of phloroglucinol; a red zone appears at the junction of the two liquids within about 10 minutes if vanillin is present. The author, however, points out that the reaction is also given by furfural and its derivatives, that these are frequently present in the wines used in the preparation of quinine wines, and that the reaction is not, therefore, characteristic of vanillin.—W. P. S.

Acetylsalicylic acid. H. L. Smith. Pharm. J., 1915, 94, 200—201.

FIVE samples of acetylsalicylic acid were compared with a sample of aspirin (Bayer) by various tests, including the rates of hydrolysis in water, 0.2% hydrochloric acid, and 1% sodium carbonate solution. Two samples of m. pt. 136° C. and 135°—136° C., respectively, and also a sample prepared by the author, m. pt. 135°—135.5° C., were practically identical with aspirin, m. pt. 135°—136° C., whilst one sample of m. pt. 133°—135° C. contained free salicylic acid and another of m. pt. 125°—127° C. was very impure and probably contained acetylsalicylsalicylic acid. Acetylsalicylic acid should not give a violet coloration with ferric chloride solution.—T. C.

Sodium salicylate solution; Discoloration of — by alkalis. H. G. Greenish and A. E. Beesley. Pharm. J., 1915, 94, 201—202.

AN aqueous solution of sodium salicylate gradually develops a brownish coloration deepening to black, on addition of sodium bicarbonate, whilst with sodium carbonate, caustic soda, and ammonium carbonate only a yellow colour is developed. The coloration appears to be due to the action of atmospheric oxygen on the salicylate in presence of sodium sesquicarbonate, $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3$, present either as an impurity in commercial sodium bicarbonate or produced in the solution by loss of carbon dioxide. The addition of small amounts of reducing agents, particularly sodium sulphite or bisulphite, greatly inhibits the development of the coloration.—T. C.

Esters; Preparation of some —. F. Bodroux. Comptes rend., 1915, 160, 204—207.

THE facility with which ethyl formate was formed by distilling ethyl alcohol with aqueous formic acid suggested that formic acid, like the mineral acids, might promote catalytically the esterification of acetic acid, but it was found to be inferior in this respect even to oxalic or picric acids. The esters of hydrobromic acid were formed in yield varying from 19 to 65%, according to the alcohol employed, by distilling the latter with aqueous hydrobromic acid, b. pt. 126° C., but these yields were much improved by using a mixture of hydrobromic and sulphuric acids obtained by passing sulphur dioxide into 180 grms. of bromine, suspended in 250 grms. of water, until decolorisation was effected. Thus with propyl alcohol an 80.3% yield of propyl bromide, and with isobutyl alcohol a 70% yield of primary and tertiary isobutyl bromides was obtained.—G. F. M.

Glycerophosphoric esters: A method for the investigation of —, and the constitution of crystallised sodium glycerophosphate. L. Grimbart and O. Bailly. Comptes rend., 1915, 160, 207—210.

IN the preparation of sodium glycerophosphate by Poulenc's method (this J., 1907, 716) there was obtained in addition to the crystallised salt, an uncrystallisable liquor which contained nearly 50% of sodium glycerophosphate. The sodium salts were converted into calcium salts, which were freed from glycerin by washing with alcohol. By oxidation in the cold with bromine water the glycerophosphate obtained from the liquor was converted into a ketone the presence of which was demonstrated by Deniges' resorcinol and salicylic acid reactions (this J., 1909, 219), and by the formation of an osazone. The crystallised glycerophosphate gave no such reactions on oxidation, and it is therefore concluded that it has the constitution, $(\text{NaO})_2\text{P}(\text{O})\text{O} \cdot \text{CH}(\text{CH}_2\text{OH})_2$, the secondary alcohol group of the glycerol being combined with the phosphoric acid, whilst the

non-crystallising salt has the constitution, $(\text{NaO})_2\text{P}_2\text{O}_5\cdot\text{O}\cdot\text{CH}_2\cdot\text{CH}(\text{OH})\cdot\text{CH}_2\text{OH}$, and thus contains the easily oxidisable $-\text{CH}(\text{OH})$ group intact.—G. F. M.

Glycerophosphates; Analysis of——. M. François and E. Boismenu. *Ann. Falsif.*, 1914, 7, 423—432.

The sample should be dried at 150°C .; calcium glycerophosphate sometimes contains from 5 to 17% H_2O . In the analysis of calcium and sodium glycerophosphates, it is usually sufficient to determine the residue on ignition, the phosphoric acid (by precipitation with molybdic acid reagent and conversion into ammonium magnesium phosphate, after the sample has been fused with potassium nitrate), and the calcium or sodium, respectively, the calcium being separated as oxalate and the sodium determined as sulphate. The actual quantity of monoglycerophosphate present may be determined by Astruc's method (this J., 1910, 900). The same methods may be applied to the analysis of granules of calcium glycerophosphate, but when the material contains sugar or other added substance, the weight of the residue on ignition loses its significance, and the presence of sugar interferes with the usefulness of Astruc's method.—W. P. S.

Glycerol; Detection and determination of free or combined——. Application to glycerophosphates. M. François and E. Boismenu. *J. Pharm. Chim.*, 1915, 11, 49—68.

GLYCEROL, either free or combined, may be identified by heating the substance under examination on a water-bath to expel any formaldehyde, alcohol, or other volatile substances, then mixing with potassium bisulphate and again heating. If glycerol is present, acrolein is formed; the acrolein vapours yield a red coloration with Schiff's reagent (magenta-sulphurous acid), the colour changing to blue on heating. The bichromate method for the determination of glycerol (Hehner, this J., 1889, 4) yields trustworthy results only if a large excess of bichromate is used, the reacting mixture sufficiently concentrated, and the oxidation allowed to proceed for at least 2 hours. The method may be applied directly to glycerophosphates. To determine phosphoric acid in glycerophosphates, the substance is heated under a reflux condenser with sulphuric acid and potassium bichromate for 2 hours, the hot mixture is diluted with water, the excess of bichromate is reduced with sodium sulphite, and, after the addition of sodium acetate, the phosphoric acid is added first as ammonium phosphomolybdate

Glycerol; Determination of ammonium magnesium phosphate preparations. C. H. Assoc., Jan., 1915. *Pharm. J. Amer. Pharm. Assoc.*, 1915, 157.

GLYCEROL can be determined in pharmaceutical preparations with a fair degree of accuracy by distilling sufficient of the same (2 grms. of glycerol with 75 c.c. of accuracy by greatly reduces the distillate to yield about *vacuo*. When most of the oil has been removed, 100 c.c. of petroleum benzene is added to the distillate and the benzene-oil mixture is distilled over, extracted with small amounts of water repeatedly, the glycerol. After shaking the aqueous remove with a small amount of benzene is evaporated off, most of the water is evaporated at a temperature not exceeding 50°C . and the residue dried in a vacuum desiccator over sulphuric acid. —T. C.

Iodine in pharmaceutical preparations; Determination of——. C. Lormand. *Ann. Falsif.*, 1914, 7, 432—441.

THE author criticises methods given in the French Codex for the determination of iodine in various preparations. To determine iodine in tincture of iodine 5 grms. of the sample is treated with 6 drops of sodium bisulphite solution, diluted with water, and the excess of bisulphite converted into sulphite by the addition of 2 drops of sodium hydroxide solution. The solution is treated with 5 drops of nitric acid, boiled, and the iodine precipitated as silver iodide after the addition of a further quantity of nitric acid. In iodine-iodide ointment a portion of the free iodine may be absorbed by the fatty constituent. The following method may be used to determine iodine in "iodo-tannin-phosphated wine":—Fifty grms. of the sample is treated with milk of lime prepared from 10 grms. of lime, the mixture is diluted to 250 c.c., filtered, and the iodide is titrated in an aliquot portion of the filtrate by means of thiocyanate.—W. P. S.

Wintergreen oil; Colour tests to distinguish natural and artificial——. G. N. Watson and L. E. Sayre. *J. Amer. Pharm. Assoc.*, Dec., 1914. *Pharm. J.*, 1915, 94, 281.

AN excess of sulphuric acid gives, with natural oil of wintergreen, a dark red colour, but no colour with the synthetic oil. With oil of birch a yellow or light shade of red is produced. When to a few drops of the oil are added 2 c.c. of concentrated sulphuric acid and 2 drops of a saturated alcoholic solution of heliotropin, the natural oil gives a crimson colour, changing to deep violet on dilution with alcohol; oil of birch reacts similarly, but the colour is not so pronounced; the synthetic oil yields a bright yellow colour, due only to the action of the acid on the heliotropin. A test which differentiates the oil of wintergreen and oil of birch is as follows:—To 1 c.c. of the oil in a test-tube add 2 c.c. of concentrated sulphuric acid, then 1 c.c. of saturated aqueous solution of chloral hydrate. With the natural oil, a deep green develops, a dark green oil layer above a lighter green aqueous zone. The addition of 2 or 3 c.c. of water aids in bringing out these shades. Oil of birch gives a deep violet oil layer. The synthetic oil produces no colour, except after long standing, when a faint violet colour may develop. A simple physical test depends upon the fact that, when oil of wintergreen is agitated in a bottle it will produce a foam, which will be retained for some time. If, on the other hand, methyl salicylate is treated similarly, it will produce no froth.

Action of ethyl alcohol on disilicon hexachloride. Martin. See VII.

PATENTS.

Alcohol; Method of and apparatus for making——. W. K. Freeman, Oswawa, N.Y., U.S.A. Eng. Pat. 28,928, Dec. 15, 1913.

HYDROGEN is passed through a chamber containing a number of carbon arcs and the resulting ethylene, after cooling, is conducted to the lower part of an absorption tower where it meets a descending stream of warm sulphuric acid. The acid liquid drawn off from the lower part of the tower contains alcohol together with ether, acetone, and sulphurous compounds; it is distilled to recover the alcohol. The absorption tower contains superposed trays filled with acid-resisting materials so that a large surface of acid is exposed to the gas, and means are provided for heating the acid and for regulating its delivery into the top of the tower.—W. P. S.

Pharmaceutical preparations [ointments, liniments, etc.]. F. E. Matthews and E. H. Strange, London. Eng. Pat. 663, Jan. 9, 1914.

PREPARATIONS for external application are obtained by mixing the salicylic ester of isopropyl or butyl alcohol, or of a polyhydric alcohol, particularly normal butyl salicylate, with oil, fat, or wax; solid substances, such as zinc oxide, magnesia, or chalk, may also be added.—W. P. S.

Carbon compounds; Process of effecting dissociative reactions upon —. W. O. Snelling, Pittsburgh, Pa. U. S. Pat. 1,124,347, Jan. 12, 1915. Date of appl., Sept. 5, 1913.

CARBON compounds capable of dissociation by heat in a reversible manner, with the liberation of hydrogen, are heated in a closed chamber or tube with walls more permeable by hydrogen than by other substances present, and the hydrogen formed is thus withdrawn during the reaction.—C. A. M.

Formaldehyde; Preparation of compounds of metals with —. H. Franzen. Ger. Pat. 277,437, April 19, 1912.

PURE compounds of metals (e.g. Pb, Ca, Sr) with formaldehyde are obtained by treating an aqueous solution of formaldehyde, either cold or at a moderate temperature, with the oxide or hydroxide of the metal; or by double decomposition of solutions of a salt of the metal and an alkali compound of formaldehyde.—A. S.

2-Piperonylquinoline-1-carboxylic acid and its homologues; Preparation of derivatives [amides] of —. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 277,438, May 25, 1913. Addition to Ger. Pat. 252,643 (this J., 1912, 1201).

THE amides of 2-piperonylquinoline-1-carboxylic acid and its homologues are prepared by the usual methods. Like the amides of 2-phenylquinoline-4-carboxylic acid and its homologues described in the chief patent (*loc. cit.*) they are tasteless, but unlike the latter they do not cause an increased separation of uric acid.—A. S.

2-Phenylquinoline-4-carboxylic acid; Preparation of derivatives of —. Chem. Fabr. auf Actien, vorm. E. Schering. Ger. Pat. 279,195, April 24, 1913.

AMINO-DERIVATIVES of 2-phenylquinoline-4-carboxylic acid are obtained by treating 2,2', 2,3', or 2,4'-nitrophenylquinoline-4-carboxylic acid with reducing agents; by the interaction of aniline, pyruvic acid, and an aminobenzaldehyde in alcoholic solution; or by adding pyruvic acid to a boiling alcoholic solution of the condensation product of aniline and an aminobenzaldehyde, and heating. For therapeutic purposes, the new products are superior to 2-phenylquinoline-4-carboxylic acid, in that they are either much less active than the latter in causing separation of uric acid or quite inactive in this respect.—A. S.

Acylated isourea ethers; Preparation of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 277,466, April 30, 1913.

ACYLATED isourea ethers are prepared by the action of bromoisovaleryl halides on isourea ethers, or on salts of the latter in presence of alkaline substances. The new products, which are odourless and readily soluble in the gastric juice, are valuable sedatives.—A. S.

8-Diketontetracarboxylic acid esters; Preparation of bicyclic —. H. Meerwein. Ger. Pat. 277,467, May 3, 1913.

MIXTURES of methylenemono- and bis-malonic acid esters, or substances capable of yielding such mixtures, are treated with alkaline condensing agents.

For example, the mixture of methylenemalonic acid methyl ester, methylene-bis-malonic acid methyl ester, and *n*-pentane- α,β,δ -hexacarboxylic acid methyl ester, obtained by condensing formaldehyde with malonic acid methyl ester, may be treated with sodium methoxide, yielding the 1.3.5.7-tetracarboxylic acid methyl ester of bicyclo-[1.3.3]-nonanedione-2.6, from which two isomeric dicarboxylic acid esters and the bicyclo-nonanedione itself may be prepared. The compounds are of value for the preparation of therapeutic agents.—A. S.

Dihydromorphine; Preparation of —. F. Hoffmann-La Roche und Co. Ger. Pat. 278,107, May 27, 1913.

THE crude product obtained by the action of hydrogen, in presence of a catalyst, on acid or neutral, aqueous or aqueous alcoholic extracts of opium, is treated with an acid if necessary, then evaporated, and treated with absolute alcohol; the impurities are dissolved and a salt of dihydromorphine remains as an insoluble residue.—A. S.

Dihydromorphine; Preparation of alkyl ethers and acyl derivatives of —. Knoll und Co. Ger. Pat. 278,111, April 29, 1913.

DIHYDROMORPHINE is treated with alkylating or acylating agents by the usual methods. Dihydrocodeine is obtained by methylating and diacetyldihydromorphine by acetylating.—A. S.

Cinchona alkaloids; Preparation of homologues of the —. Ver. Chininfabriken Zimmer und Co., G. m. b. H. Ger. Pat. 279,012, Sept. 13, 1913.

KETONES derived from cinchona alkaloids (compare this J., 1909, 381, 541) are converted in the usual way, by means of organo-magnesium compounds, into the corresponding tertiary alcohols. The products contain one alkyl group more than the original alkaloids.—A. S.

Erythrene; Preparation of —. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 278,647, Aug. 5, 1913.

ERYTHRENE is isolated by known chemical or physical methods from the gases produced by the incomplete combustion of organic substances.—A. S.

3-Amino-1-hydroxybenzene-arsine; Manufacture of derivatives of —. Farb. vorm. Meister, Lucius, und Brünig. Ger. Pat. 278,648, Feb. 20, 1913.

BY the action of formaldehyde-sulphoxylates on 3-amino-1-hydroxybenzene-arsine, compounds are formed which are not oxidised on exposure to air, and which yield soluble salts giving neutral solutions. These compounds are of value for therapeutic purposes and for the preparation of other medicinal substances.—A. S.

Arsenic acid compounds of the higher polyhydric alcohols and their salts; Manufacture of —. F. Hoffmann-La Roche und Co. Ger. Pat. 279,254, July 12, 1913.

THE higher polyhydric alcohols or their esters are heated with arsenic anhydride *in vacuo* to a high temperature, and the products converted into salts in the usual way.—A. S.

Protocatechuic acid and protocatechuic aldehyde; Manufacture of —. L. Schmidt. Ger. Pat. 278,778, Sept. 16, 1913.

PROTocatechuic acid is obtained by the action of chlorine on piperonal in the absence of sulphuric acid. By the action of chlorine on piperonal

chloride dichloropiperonal chloride is formed, and this yields protocatechuic aldehyde when decomposed with water.—A. S.

5(4)-Methyl-4(5)-arylaminomethyliminazoles; Preparation of ——. O. Gerngross. Ger. Pat. 278,884, July 23, 1914. Addition to Ger. Pat. 276,541.

5(4)-METHYL-4(5)-ARYLAMINOMETHYLIMINAZOLES of the type described in the chief patent (this J., 1914, 1004) are prepared by the action of 5(4)-methyl-4(5)-chloromethyliminazole or its salts on primary aromatic amines. They possess valuable pharmacological properties, causing an increase in the pressure of the blood and also acting as antiseptics against lower organisms, whilst they are less poisonous than β -iminazolyethylamine.—A. S.

Hexamethylenetetramine di-iodide; Preparation of ——. M. Rix. Ger. Pat. 278,885, Oct. 15, 1913. Addition to Ger. Pat. 275,974 (this J., 1914, 943).

HEXAMETHYLENETETRAMINE di-iodide is obtained by allowing the components, in the form of powder, to interact in presence of a small quantity of an inert solvent. In presence of traces of alcohol, for example, insufficient to make the mixture sensibly moist, the reaction is complete within a few seconds.—A. S.

Pyrrole; Preparation of α -alkyl derivatives of ——. Farbenfabr. vorm. F. Bayer und Co. Ger. Pat. 279,197, Jan. 25, 1913.

THE radicals of polyhydric alcohols, their derivatives, or equivalents, are introduced into the α -position of the pyrrole ring by the methods used for the introduction of radicals of monohydric alcohols. The new products may be used in the synthesis of alkaloids of the pyrrole and pyrrolidine series.—A. S.

Mercurised amino-compounds; Manufacture of ——. J. D. Riedel A.-G. Ger. Pat. 279,199, Oct. 7, 1913.

THE alkali salts of aminomethanedisulphonic acid are treated with mercuric oxide in presence of water. The resulting compounds do not precipitate albumin from solution, and their aqueous solutions, which will keep unaltered for a long time, if treated with a small quantity of alkali carbonate and protected from the air, may be used medicinally for injections.—A. S.

Hydrolecithin; Preparation of ——. J. D. Riedel A.-G. Ger. Pat. 279,200, Jan. 27, 1914. Addition to Ger. Pat. 256,998 (this J., 1913, 507).

LECITHIN is reduced to hydrolecithin in aqueous solution by treatment at the ordinary temperature with hydrogen or a mixture containing hydrogen, in presence of a catalyst, such as a finely-divided or colloidal platinum metal, and salts of bile acids, e.g., cholates, taurocholates, glycocholates, choleates, or desoxycholates, or mixtures of the same.—A. S.

Cascara sagrada; Preparation of an extract of — free from bitter substances and soluble in water. M. Penschuck. Ger. Pat. 279,214, March 3, 1914.

THE powdered drug is mixed with zinc oxide and a sufficient quantity of water thoroughly to moisten the mixture, and exposed to the air, in thin layers, at the ordinary temperature for 7–10 hours, with frequent vigorous stirring; the moist mass is then subjected to high pressure, and the expressed extract evaporated *in vacuo*.—A. S.

Esters of higher hydroxy-fatty acids; Preparation of ——. E. Freudenberg and L. Klocman. Ger. Pat. 279,255, July 3, 1913.

ESTERS of higher unsaturated fatty acids are treated with hydrogen peroxide in presence of a

catalyst. The products have a higher specific gravity than the original esters and are valuable therapeutic agents.—A. S.

Fat and oil compounds; Dry ——. M. Hamburg, Bishop Stortford. U.S. Pat. 1,124,611, Jan. 12, 1915. Date of appl., Dec. 13, 1913.

SEE Eng. Pat. 29,481 of 1912; this J., 1913, 672.

Pharmaceutical product [alkyl ethers of α -bromoiso-valerylisocrotonic acid]. M. Engelmann and B. Merkel, Elberfeld, Germany, Assignors to Synthetic Patents Co., Inc., New York. U.S. Pat. 1,126,432, Jan. 26, 1915. Date of appl., April 8, 1914.

SEE Ger. Pat. 277,466 of 1913; preceding.

Beta-acetyl-alkyl-dialkylamines. G. Merling, Elberfeld, and O. Chrzesinski and H. Köhler, Leverkusen, Assignors to Farbenfabr. vorm. F. Bayer und Co., Elberfeld, Germany. U.S. Pat. 1,126,549, Jan. 26, 1915. Date of appl., June 5, 1913.

SEE Eng. Pat. 14,231 of 1913; this J., 1913, 1128.

Manufacture of azo dyestuffs containing arsenic. Ger. Pat. 278,421. See IV.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photographic papers; Sensitometry of ——. L. A. Jones, P. G. Nutting, and C. E. K. Mees. Phot. J., 1914, 54, 342–359.

AN attempt has been made to apply to photographic papers and prints similar principles of examination to those first applied by Hurter and Driffield (this J., 1890, 455) to photographic plates and negatives. Density values by reflected light (D_r) were determined directly by means of a modified form of the Bechstein illuminometer. The same light source is used to illuminate a piece of opal glass and the density to be measured; by a suitably arranged adjustable sector and set of lenses the luminosity of the opal can be varied and the amount of variation read off on a scale; the density is illuminated at 45° and viewed at 90° so as to avoid all specular reflection. The images of the two illuminated objects are brought together in a photometer cube. In every series of measurements the instrument is first set to read 100% when a piece of the same paper, developed and fixed, but not exposed, is placed in the position of the density. The instrument enables the reflecting power of the density to be determined; calling this R (expressed decimally) the authors deduce

$$D_r (\text{reflection density}) = -\log \frac{1}{R}$$

an expression of the same form as that for transmission density in the case of a negative. The reflecting density is dependent on three factors—the surface reflection of the density, the surface reflection of the paper on which the emulsion is coated, and the amount of the silver deposit. The following formula is given as representing these relationships:—

$$D = \log \frac{1}{(1-C)T^2R_p + C}, \text{ where } C \text{ is the surface reflection, } T \text{ the transmission of the deposit, and } R_p \text{ the reflecting power of the paper. The paper}$$

to be examined was exposed behind a sector wheel having steps in the ratio of $\sqrt{2}$ instead of the usual wheel with a ratio of 2. Characteristic curves of a number of papers were obtained by plotting D_r against exposure. Some of these curves resemble closely the characteristic curves of plates, showing a first part of increasing slope, a middle straight part, and a last part of decreasing slope, called "under," "correct," and "over" exposure, respectively.

"Maximum black" is defined as the reflecting power of the deepest deposit that can be obtained. This was found to vary from 1% to 10% of the incident light (D_r from 2 to 1), from 8% to 10% being a greyish black and from 1% to 3% a very intense black. Generally a "glossy" paper gave a higher maximum black than a carbon surface, the latter than a "matt" surface; and a soft paper gave a lower value than a hard paper. The following limiting values for good papers are suggested:—Matt soft, 1:1, hard 1:35; glossy soft, 1:5, hard 1:8. Gamma, as with photographic plates, is the slope of the straight line portion of the curve ($\tan a$), with the difference that the normal practice with papers is to develop to a maximum γ , so that γ with papers corresponds to γ_x with plates. "Total scale" is the density difference between the points on the under exposure and over exposure curves at which gamma is 0.2, at which points a 25% difference of exposure is required to produce an appreciable difference of density—about 0.02. The densities on either side of the two points selected may be of value in the print, and it may be more logical to regard total scale as the density difference from just perceptible darkening to just appreciably less than maximum black, but the use of the limits mentioned are regarded as more generally useful. "Contrast" is dependent on γ and "total scale." The variations in "total scale" given are from 0.9 to 1.7; variations in γ were found to range from 1.1 up to 2.65. "Rendering power" is defined as the ratio between latitude and total scale, in which the "latitude" of the paper is the length, in log. exposure, of the straight line portion of the curve; the ratio is multiplied by 10 to keep the values of rendering power between 0 and 10. The "rendering power" thus is a measure of the power of the paper to reproduce the negative proportionally, throughout the whole of its— the negative's—scale if the latitude and the total scale were the same, i.e., if the characteristic curve were only a straight line, the rendering power would be 10; in a table given, the variations in "latitude" are from 0.35 to 0.75 and in rendering power from 2.5 to 5. "Standard exposure" is defined as the minimum exposure in candle-metre-seconds, necessary to print through a density of 2.0, or 100 times the "threshold value" of the paper; for the purpose of this definition the term "candle" is defined as one visual candle-power of the light emitted by a tungsten incandescent lamp burning at an efficiency of 1.25 watts per mean horizontal candle-power. Knowing the "standard exposure" of the paper, E_s , and the maximum density of the negative being printed from, D_m , then the correct exposure becomes

$$E = \frac{E_s}{\text{anti-log.}(2 - D_m)}$$

The "latitude" of a paper rarely exceeds 0.75 = 5.6 in actual exposures while the range of a negative may easily be 1 to 34 in exposures. It is therefore necessary to examine a negative as to the most important parts and arrange to print these on the straight line part of the paper. Three types of negative are specified and their treatment discussed. The general method is the same in each case—the range of densities in the "important" part of the negative is measured and a paper

selected having approximately the same "total scale," the exposure being then adjusted as already mentioned. The effect of development was very similar to the effect in the case of plates, where a bromided developer is used. There is a period at the beginning of development where γ rises and the inertia value decreases, and a further period, after γ has risen to a maximum, where the only apparent effect is the "regression of the inertia." It is not always easy to stop development before γ has reached its maximum, so that only parallel movement to the left is seen when the curves are plotted. The authors find carbon paper and especially platinum paper to have short straight line portions and low values of maximum black, though with considerable total scale, and low gammas. On the other hand, gelatino-chloride print-out papers showed a long total scale with high maximum blacks, but with a short latitude and therefore low rendering power. The paper concludes with two tables, one of which shows for a range of standard exposures (E_s in C.M.S.) from 50 up to 204,800, the necessary exposures for negatives with a range of maximum densities from 2.1 up to 3; the other table gives the constants for a number of bromide, gaslight, and print-out papers. (See also Renwick, Phot. J., 1913, 53, 127.)—B. V. S.

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Explosive. C. A. Woodbury, Chester, Pa., Assignor to E. I. du Pont de Nemours Powder Co., Wilmington, Del. U.S. Pat. 1,124,679, Jan. 12, 1915. Date of appl. May 18, 1912; renewed June 9, 1914.

AN explosive detonating at relatively low velocity is obtained by incorporating ammonium nitrate in relatively large (globular) particles with nitroglycerin and an absorbent.—C. A. M.

XXIII.—ANALYTICAL PROCESSES.

Silver; Volumetric determination of.—C. Debrun. Ann. Falsif., 1914, 7, 407–409.

IN the Gay-Lussac method silver is determined by titration with a sodium chloride solution, of which 100 c.c. at 15° C. is equivalent to 1 gm. of silver. When the titration is made at a temperature other than 15° C., the volume of the sodium chloride solution used must be corrected, and the author gives the necessary corrections in tabular and graphic form. Thus, at 0° C., 100 c.c. of the solution will have an apparent volume of 99.953 c.c.; at 5° C., 99.938 c.c.; at 10° C., 99.956 c.c.; at 20° C., 100.092 c.c.; at 25° C., 100.205 c.c.; at 30° C., 100.328 c.c.; and at 35° C., 100.484 c.c.—W. P. S.

Corrections in bomb calorimetry. Huntly. See II A.

Fractional combustion of gases over copper oxide. Terres and Manguin. See II A.

Determination of the percentage of toluene in commercial solvent naphtha. Colman. See III.

Determination of very weak acids and bases by means of electric conductivity measurements. Horiba. See VII.

Determination of formic and acetic acids and the separation of these acids in very dilute solutions. Heuser. See VII.

Method of determining sulphites, thiosulphates, and polythionates. Sander. See VII.

Determination of arsenic in iron, steel, and ores. Kleine. See X.

Rapid determination of iron in commercial pyrophoric alloys [of iron and cerium]. Bellucci. See X.

Detection of nickel in hardened oils. Prall. See XII.

Potassium cyanide as a qualitative reagent for tanning materials. Bennett. See XV.

Determination of nitrogen in leather. Nihoul. See XV.

Stanek's new method for the determination of sucrose by double polarisation in beet molasses. See XVII.

Rapid determination of total tartaric acid and potassium in wines. Kling and Lassieur. See XVIII.

Determination of potassium hydrogen tartrate and tartaric acid. Astruc. See XVIII.

Contributions to water analysis. Winkler. See XIXB.

Volumetric determination of cinchona alkaloids. Dufilho. See XX.

Assay of opium. Dohme. See XX.

Detection of vanillin in quinine wines. Chauvin. See XX.

Detection and determination of free or combined glycerol. Application to glycerophosphates. François and Boismenu. See XX.

Analysis of glycerophosphates. François and Boismenu. See XX.

Determination of glycerol in pharmaceutical preparations. Briggs. See XX.

Determination of iodine in pharmaceutical preparations. Lormand. See XX.

PATENTS.

Gas-analysis apparatus. C. W. Heath, Cincinnati, Ohio. U.S. Pat. 1,124,432, Jan. 12, 1915. Date of appl., March 5, 1914.

THE caustic absorbing solution is contained in a vessel of inert material, and is covered by a layer of oil which may be forced by the pressure of the residual gas into the measuring tube. Corrosion of the measuring apparatus by the caustic solution and also the action of air on the latter, are thus prevented.—W. F. F.

Pyrometer; Radiation—. R. S. Whipple, Cambridge, Assignor to The Taylor Instrument Companies, Rochester, N. Y. U.S. Pat. 1,125,233, Jan. 19, 1915. Date of appl., Aug. 18, 1910.

SEE Eng. Pat. 21,369 of 1909; this J., 1910, 1239.

XXIV.—MISCELLANEOUS ABSTRACTS.

Catalytic action. J. Bosseken. Rec. Trav. Chim. Pays-Bas, 1914, 33, 195—203. Bull. Soc. Chim., 1914, 15, 783.

THE action of a catalyst may be explained by the formation of an intermediate product, or by its decomposing action on the molecule with consequent concentration of the active portions. Results obtained by the author and his pupils are more in accord with the latter theory. For instance Olivier (see page 217), found that a catalyst exerts its maximum power in the free state. It is held that the catalyst forms with the substance activated a compound capable of dissociation, and that the activity of the catalyst is greater the wider the limits of temperature and pressure within which such dissociation can take place.

—R. G. P.

Trade Report.

German chemical export trade; The — and the war. H. Grossmann. Chem.-Zeit., 1914, 38, 1169—1173.

THE internal demand for chemical products is well maintained, and the trade with many neutral countries is uninterrupted; but the industry is suffering appreciably from cessation of trade with enemy powers and lack of certain raw materials, among which the following are prominent: sulphur pyrites, chromium and tungsten ores, bauxite, phosphate minerals, saltpetre, copper and other metals, vegetable fats and oils, lard, petroleum, wool, flax, hemp, jute, rubber, and iodine. Great Britain has been the chief customer for sugar (annual production 917,000 metric tons) and aniline and coal-tar colours (annual production 64,300 metric tons). In 1913 the total German imports of chemical materials comprised in Group 4 of the customs' tariff were valued at M. 430,385,000 (£21,000,000), including acids, salts, etc., to the value of M. 278,187,000 (£13,500,000); the exports reached a value of M. 956,414,000 (£47,000,000), including M. 377,087,000 (£18,000,000) for acids, salts, etc., M. 298,044,000 (£14,300,000) for dyestuffs, and M. 101,256,000 (£5,000,000) for fine chemicals and pharmaceutical products. Taking into account the chemical products not included in the above tariff group, the total value of German chemical exports in 1913 is estimated at two milliards of marks (£97,500,000). In the following list for the four chief countries concerned in this trade, the two unbracketed numbers represent Germany's imports and exports, respectively, in millions of marks, for 1913; the bracketed number gives in each case the amount corresponding to agricultural and forest products: U.S.A., 1711.1 (1138.0), 713.2 (131.8); Great Britain, 875.9 (154.3), 1438.2 (365.7); Austria-Hungary, 827.5 (157.2), 1104.8 (185.2); Russia, 1424.6 (1304.7), 880.2 (155.6). It is stated that the shortage of German chemicals is having a serious effect in N. America, especially in the glass, leather and textile industries, and that lack of potassium chloride has brought the electrolytic manufacture of potash to a standstill. On the other hand, the nitrolin industry is flourishing in N. America, as it is also in Germany. The author suggests that there is a tendency in Germany to underrate the importance and capacity of the British chemical industry, and reference is made to the exhibits of British firms at the Brussels and Turin Exhibitions and to the work of Mond. The enterprise

shown in the British fat and oil industry is contrasted with the neglect of organic chemical processes requiring a complicated technique. Efforts are to be made through the German metal exchanges to free the metal trade from the London influence, which is said to rest upon a traditional rather than an economic basis; similar steps are to be taken respecting other raw materials. Much attention is devoted to the question of the production of dyes in Great Britain: it is pointed out that after 50 years' neglect the organisation of such an industry presents great difficulties. It is assumed that after the war Austria, Russia, Belgium, and France will continue to draw their supplies of chemicals from Germany and that much of the loss now being sustained will then be recovered: in this connection the considerable drain made by the war upon German trained technical chemists is mentioned.—J. R.

Chemical industry and war. H. Grossmann. *Z. angew. Chem.*, 1915, 28, 17—20.

THE author examines the effect of the war on the chemical industries of various countries and the prospects of the German chemical industry after peace is restored. Shortage of coal and derived products is said to exist among the hostile nations with the exception of Great Britain. In Germany much attention is being devoted to the provision of rubber, cotton, petroleum, animal and vegetable oils, metals, and various ores (see preceding abstract). After the war Germany, it is urged, should seek additional markets rather than limit her foreign commercial intercourse. The American plan of a periodic compilation of industrial statistics is advocated, so that, among other advantages, the productive capacity of an industry might be taken into account in fixing maximum prices. Reference is made to the increasing demand and the diminishing supply of chemicals in Great Britain, as evidenced by advertisements. The necessity of appealing to the State for help in developing chemical industries is adversely commented upon. It is stated that the United States, in spite of a rapid development of chemical manufactures, is still almost wholly dependent upon Germany for dyes and other chemical products, any interruption of which would seriously affect a number of industries. The war will probably stimulate the American production of such materials, and efforts will be made to capture the S. American market. In Switzerland, the dividend of the "Gesellschaft für chemische Industrie" at Bâle has been reduced from 10% to 6%, and the erection of the proposed soda works at Olten is doubtful. Russia is suffering from a shortage of coal; and notwithstanding the great progress recently made by the Russian chemical industry with the help of German capital and intelligence, there is a great lack in the country of chemical and pharmaceutical preparations, which are being imported from Japan; commercial chloroform has even had to be purified in the University laboratory at Moscow. At the outbreak of the war Russian Poland contained 264 chemical factories with 9200 hands, employed in the production of such articles as soap, candles, cosmetics and perfumes to the annual value of 30,000,000 roubles (nearly £3,200,000). According to official figures, on September 1st out of 257 chemical factories with 60,721 employees, 58 factories with 42,741 employees were working part time, while 4 factories had increased their staff from 763 to 900. In the Moscow district 16% of the works were running normally, 80% had diminished their output, and 4% had shut down. Raw materials are generally scarce. The Russian agricultural, wood, sugar, and spirit industries offer great possibilities of development.

Little is known of the condition of affairs in France, although the occupation of the N.E. region must have had serious consequences for the chemical industry; the electrochemical industry in the Alpine district has also probably suffered. In Austria-Hungary the petroleum industry, the overseas trade, and the Balkan export trade have all undergone serious disturbance. A closer economic relationship between Austria and Germany is foreshadowed. It is predicted that, in spite of the loss of so many skilled chemists in the war, Germany will be able to meet all foreign competition on the conclusion of peace.—J. R.

France; "Prohibited" goods which may be exported from —. Board of Trade J., Feb. 18, 1915.

A DECREE of the French Minister of Finance, dated the 12th February, abrogates the prohibition of export and re-export in respect of the under-mentioned articles, hitherto included in the Prohibited List, so far as concerns consignments which are destined for the United Kingdom, the British Dominions, Colonies and Protectorates, Belgium, Japan, Montenegro, Russia, Servia, or the United States of America:—Acetone; anhydrous and hydrated alumina and salts of alumina; aluminium, ore and metal, pure or alloyed; pitch of resin (*brâis de résine*), pine and fir resin, colophony, oil of turpentine; cocoa, chocolate; camphor; calcium carbide; carbons for electricity; copper, ore or metal, pure or alloyed, boiler-makers' wares and tubes of copper; hydrogen peroxide; cinchona bark; tin, ore and metal, pure or alloyed; extracts of quinine; oleaginous fruits and seeds; glycerin; animal greases (fats) other than that from fish (tallow, lard, lanoline, margarine, oleomargarine, and similar substances); graphite; whale oil; vegetable oils, other than castor oil and pulghera oil; condensed milk, with or without the addition of sugar; yeasts; filings and waste of copper, tin, zinc, pure or alloyed; mercury (ore and metal); ores of chromium, manganese, molybdenum, titanium, tungsten, and vanadium; iron ore; nickel (ore and metal, pure or alloyed); aluminium wares other than jewellery; paraffin; phosphorus and phosphates of lime; lead, ore and metal, pure or alloyed, lead pipes; sea salt, salina salt, and rock salt, crude or refined; sulphur and pyrites; zinc ore.

* New Books.

[The Roman numerals in thick type refer to the similar classification of abstracts under "Journal and Patent Literature" and in the "List of Patent Applications."]

I. *McCollum, B., and O. S. Peters*: Surface insulation of pipes as a means of preventing electrolysis. Wash., D.C., Gov. Pr. Off. 1914. 44 p. il. pl. 8vo. (U.S. Bu. of Standards. Techn. pap. No. 15.) 1915.

Smith, A. W.: Materials of machines. 2nd ed. Cr. 8vo. Chapman and Hall. London. 1915. Net 5s. 6d.

IIA. *Jones, E.*: The anthracite coal combination in the United States; with some account of the anthracite industry. Cambridge, Mass., Harvard Univ. c. 1914. 13 + 261 p. (13 p. bibl.), tabs. charts, O. 1915. \$1.50 n.

Institution of Gas Engineers. Transactions. 8vo. Spon. London. 1915. Net 10s. 6d.

- Webber, W. H. Y.:** Gas supply in principle and practice. N.Y., Macmillan. 2+199 p. il. 12mo. \$1.25 n.
- Stillman, T. B.:** Examination of lubricating oils. Easton, Pa., Chemical Pub. c. 1914. 125 p. il. fold. tab. 8vo. 1915. \$1.25.
- HB. Manufacture of electric arc carbons.** 8vo. pp. 66. "Electrician." London. 1915. Net 2s. 6d.
- V. Stecher, G. E.:** Cork, its origin and industrial uses. 87 p. front. tabs. 12mo. Van Nostrand. 1915. \$1 n.
- IX. Weiss, H. F.:** The preservation of structural timber. N.Y., McGraw-Hill. 312 p. il. 8vo. 1915. \$3 n.
- X. Brearley, H.:** The case-hardening of steel. Illustrated. 8vo. pp. 186. Hiffe. London. 1915. Net 7s. 6d.
- Giolotti, F.:** The cementation of iron and steel; tr. from the Italian by J. W. Richards and C. A. Rouiller. N.Y., McGraw-Hill. 407 p. il. 8vo. 1915. \$4 n.
- Houghton, E. F. and Co., Philadelphia:** Steel and its treatment, by the metallurgical staff. 2nd ed. Phil. (The author) c. 1914. 104 p. il. pls. diags. 12mo. 1915. \$1.
- Electric welding.** 48 p. illus. 8vo. Indus. P. 1915. 25c.
- Park, J.:** Text-book of practical assaying. Cr. 8vo. pp. 354. C. Griffin. London. 1915. Net 7s. 6d.
- Rosenhain, W.:** An introduction to the study of physical metallurgy. N.Y., Van Nostrand. 1914. 22+368 p. il. pls. figs. tabs. O. \$3.50 n.
- XI. Timbie, W. H., and Higbie, H. H.:** Alternating-current electricity and its application to industry. N.Y., Wiley. c. 1914. 80+534 p. figs. 8vo. 1915. \$2 n.
- Townsend, J. S.:** Electricity in gases. 8vo. pp. 512. Clarendon Press. London. 1915. Net 14s.
- XII. Ellis, C.:** Hydrogenation of oils. Catalysts and catalysis and the generation of hydrogen. 8vo. Constable. London. 1915. Net 16s.
- Vitetta, G.:** Manuale di olivicoltura pratica. Casalmoferrato. 16°. p. XVI. 250. 1914. Lire 3.
- XIII. Ingle, H.:** A manual of oils, resins, and paints. Vol. I. Analysis and valuation. Cr. 8vo. pp. 138. C. Griffin. London. 1915. Net 3s. 6d.
- XVI. Royal Agricultural College, Cirencester; Annual Scientific Bulletin of the —.** Nos. 4 and 5. 1912-1913. Swd. 8vo. pp. 108. W. H. Smith and Son. London. 1915. 2s.
- Brenchley, W. F.:** Inorganic plant poisons and stimulants (Camb. Agri. Monographs). 8vo. pp. 110. Cambridge Univ. Press. London. 1915. Net 5s.
- Burgess, P. S.:** Soil bacteriology, laboratory manual. Easton, Pa., Chemical Pub. c. 1914. 8+123 p. il. forms. 12mo. 1915. \$1.
- Forli, C.:** I concimi e le concimazioni. 2a ediz. Torino. 4to. fig., p. 414. 1914. Lire 10.50.
- Marescalchi, A.:** Guida pratica per la concimazioni. Casalmoferrato. 16°. fig. p. IX. 137. 1914. Lire 2.
- Mukarji, N. G.:** Handbook of Indian Agriculture. 3rd ed., revised. 8vo. Thacker. London. 1915. Net 15s.
- Smith, E. F.:** Bacteria in relation to plant diseases. v. 3, Vascular diseases (continued). Wash., D.C., Carnegie Inst. 8+309 p. il. pls. Q. (Publications). pap. 1915. \$5.
- XIXA. Vulte, H. T. and Vanderbilt, S. B.:** Food industries: an elementary text-book on the production and manufacture of staple foods. Easton, Pa., Chemical Pub. c. 1914. 8+309 p. (7 p. bibl.) il. 8vo. 1915. \$1.75 n.
- XIXB. Jameson, R. N.:** Methods of sewage disposal for Texas cities (Austin, Tex.). Univ. of Tex. 1914. 64 p. (11 p. bibl.). 8vo. (Bull.) 1915.
- Kershaw, G. B.:** Sewage purification and disposal. 8vo. pp. 350. Camb. Univ. Press. London. 1915. Net 12s.
- Metcalf, L., and Eddy, H. P.:** American sewerage practice. v. 1. Design of sewers. N.Y., McGraw-Hill. 747 p. il. 8vo. 1915. \$5 n.
- Koller, Th.:** Utilisation of waste products. A treatise on rational utilisation, recovery and treatment of waste products of all kinds. Translated from the second revised German edition. Second English revised edition. 340 pp., with 22 illus. Demy 8vo. London. 1915. 7s. 6d. net.
- XXIV. Annuario di chimica scientifica ed industriale** colle applicazioni all'agricoltura ed industrie agronomiche, alla metallurgia, ecc. diretto dal prof. Guareschi coadiuvato da un'eleita di chimici (Supplemento annuale all'Enciclopedia di chimica) Anno XXX (1913-1914) Torino. 4to. fig., p. 480. 1914. Lire 15.
- Chemical Manufacturers' Directory of England, Wales and Scotland.** With some Firms in Ireland. 1915. 8vo. Lds. Simpkin. London. Net 2s. 6d.
- Crookes, Sir Wm.:** Acquired radio-activity (Royal Soc.). 4to. swd. pp. 14. Dulau. London. 1915. Net 1s. 6d.
- Luff, A. P., and Candy, H. C. H.:** A manual of chemistry, theoretical and practical, inorganic and organic. New, enlarged ed. 12mo. pp. 680. Cassell. London. 1915. Net 8s. 6d.
- Oscroft, P. W.:** Advanced inorganic chemistry. Cr. 8vo. pp. 512. Bell. London. 1915. Net 5s.
- Mills, G. J.:** Chile; physical features, natural resources, means of communication, manufactures and industrial development; with introd. by W. H. Koebel. N.Y., Appleton. 1914. 22+193 p. il. pls. fold. maps. O. 1915. \$1.50 n.
- Rogers, A. (ed.):** Industrial chemistry, a manual for the student and manufacturer; 305 illustrations. 2nd ed., thoroughly rev. and enl. N.Y., Van Nostrand. c. 1912-1915. 20+1005 p. Q. \$5 n.
- La Marca, F.:** Il corbezzolo e la sua utilizzazione. Casalmoferrato. 16°. fig. p. 105. 1914. Lire 1.50.

* Compiled by H. Grevel and Co., 33, King Street, Covent Garden, London, W.C., from whom all the works in the preceding list can be obtained.

